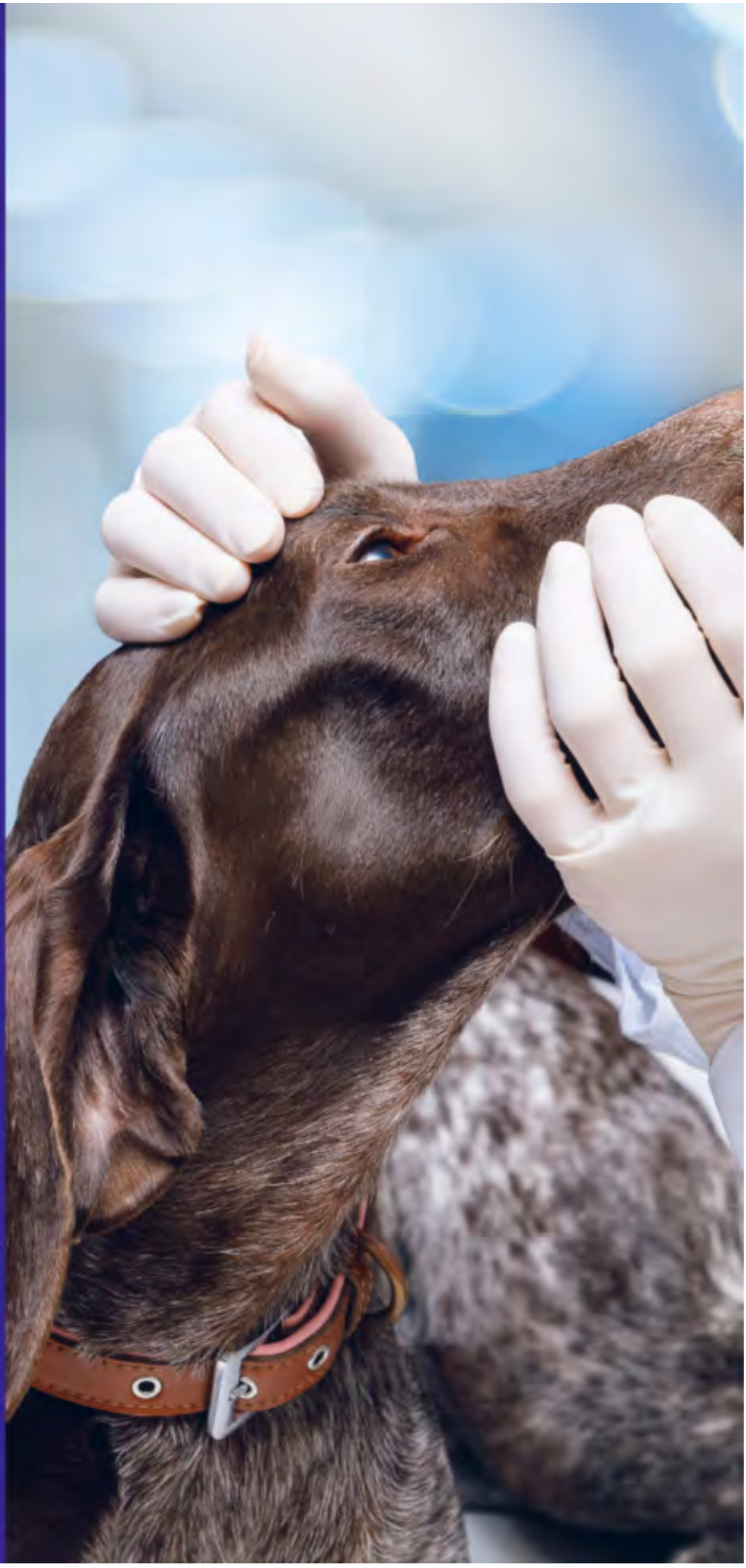
14th Edition

The Blue Book

OCULAR DISORDERS PRESUMED TO BE INHERITED IN PUREBRED DOGS



GENETICS COMMITTEE OF THE AMERICAN COLLEGE OF VETERINARY OPHTHALMOLOGISTS

2022

Foreword

Ocular disorders, proven or presumed to be inherited in purebred dogs, have been a topic of intense dialogue by Diplomates of the American College of Veterinary Ophthalmologists (ACVO) for many years. Discussions commenced in the latter half of the 20th century during the early days of this College's inception, have continued into the 21st century, and will no doubt continue for years to come. Our knowledge of the existence, nature, progression, and inheritance of ocular disorders continues to expand as this field of veterinary science evolves. The Genetics Committee of the ACVO was originally formed in response to requests by registries, breed groups, and veterinarians, with the intent to provide a scientific advisory panel and guidelines regarding ocular disorders in purebred dogs. The Genetics Committee of today remains engaged in an ongoing effort to update information on ocular disorders for this purpose.

The content of this production has originated from several sources as the ACVO recently created a Companion Animal Eye Registry (CAER), which is a joint effort between the Orthopedic Foundation for Animals (OFA) and the ACVO. The addition of eye examination results to the OFA database makes the OFA the most complete source of canine health screening results in the world, allowing responsible breeders to make more informed breeding decisions in an effort to reduce the incidence of inherited disease.

The generation of statistical information is made possible by the efforts of dedicated breeders of purebred dogs who present their dogs to Diplomates of the ACVO for an OFA Companion Animal Eye Registry examination. The research copies of these examinations are then conscientiously submitted to OFA by the examining Veterinary Ophthalmologists. These data generate annual statistics. The statistics for each breed are then reviewed by the Genetics Committee for the most recent year and from the previous 5 years. Recommendations regarding the ocular disorders listed for each breed and the breeding advice are compiled following guidelines detailed elsewhere in this publication. A comprehensive review of the scientific literature since the last published edition was undertaken by all committee members. The scientific articles and breed disorders from the statistical and literature review have been added to the information on each breed in the production of this document. The collective educated clinical experience of the committee members is utilized to reach a consensus of opinion in areas where there remains a paucity of hard scientific proof regarding certain identified breed problems.

The current Genetics Committee has instituted an annual scientific literature search, in addition to the previously established yearly statistical data review. This information is compiled and submitted in an effort to maintain a bank of current information for future editions and versions of this document. The content of all editions past, present, and future will remain dynamic and ever changing as more precise technologies advance the study of the canine genome, as continued scientific research expands our knowledge, and as the database grows.

It is an honor and a privilege to serve the ACVO, our fellow Diplomates, reputable dog breeders, and our most trusted canine companions in this endeavor.

Genetics Committee 2023

Sony Kuhn Asif (Chair), Melissa Kubai (Co-chair), Freya Mowat (Past Chair), Ursula Dietrich, Katelyn Fentiman, Simone Iwabe, Sami Pederson, Emily Sharp

Gus Aguirre – Advisor
Simon Petersen-Jones – ECVO Advisor
Katie Diehl – OFA Liaison

14th Edition
2022 Version Acknowledgements

The following groups and individuals deserve credit for the production of this edition of Ocular Disorders Presumed to be Inherited in Purebred Dogs ("The Blue Book"):

The ACVO Board of Regents

Genetics Committee Chairs Dr. Andras Komaromy 2006-2008, Dr. Katie Diehl (2009-2011), Dr. Jacqueline Pearce (2011-2012), Dr. Carrie Breaux (2011-2013), Dr. Kenneth Pierce (2014), Dr. Wendy Townsend (2015), Ellen Belknap (2016), Jessica Meekins (2017), Renee Carter (2018), Adam King (2019), Jane Ashley Huey (2020), Katelyn Fentiman (2021), Freya Mowat (2022) and all previous Genetics Committee members

Eddie Dziuk, Chief Operating Officer, and Erika Werne, CAER Program Manager, for the OFA

Introduction

What is the purpose of this book?

The Orthopedic Foundation for Animals (OFA), Canine Eye Registration Foundation (CERF), other breed registry groups, breed clubs, and practicing veterinarians have requested that the American College of Veterinary Ophthalmologists (ACVO) provide a scientific advisory panel to furnish guidelines regarding ocular disorders of major concern to purebred dogs. The Genetics Committee of the ACVO was formed in response to these requests and is engaged in an ongoing effort to update information on ocular disorders proven or suspected to be hereditary in purebred dogs. The compendium of ocular disorders and breeding recommendations which follow are interim guidelines. They are reviewed regularly and revised whenever additional information becomes available.

How can this information be used?

National and international breed clubs are encouraged to submit their input regarding breeding decisions for ocular disorders found in their breeds. **Local breed clubs** can participate by encouraging and organizing ocular examination clinics and forwarding their requests and concerns to their national organization. **Practicing veterinarians** are encouraged to contribute by informing all owners of potential breeding animals of the value and availability of ocular examinations, prior to breeding. Information regarding ocular disorders found in litters or individuals can be forwarded to the Genetics Committee via any ACVO diplomate. **Individual breeders** wishing to uphold high ethical standards for the improvement of their breed are urged to contribute by annual examination of their breeding animals and by encouraging the same from other breeders. Further information can be obtained from the Orthopedic Foundation for Animals (OFA): 2300 E Nifong Boulevard, Columbia, MO, 65201-3806, 573-442-0418. Only through increased awareness of the problems and a sustained cooperative effort to disseminate accurate information, will we be able to control and/or eliminate hereditary eye diseases in purebred dogs.

How do we identify an inherited eye disease?

Although there are noteworthy exceptions, most of the ocular diseases of dogs which are presumed to be hereditary have not been adequately documented. Genetic studies require examination of large numbers of related animals in order to characterize the disorder (age of onset, characteristic appearance, rate of progression) and to define the mode of inheritance (recessive, dominant). In a clinical situation, related animals are frequently not available for examination once a disorder suspected to be inherited is identified in an individual dog. Maintaining a number of dogs for controlled breeding trials through several generations is a long and costly process. Both of these obstacles are compounded by the fact that many ocular conditions do not develop until later in life. Due to the potential for disease to arise from inherited genetic defects at any age, the Genetics Committee recommends annual eye exams.

Until the genetic basis of an ocular disorder is defined in a published report, we rely on what statistical information is available from registry organizations, informed opinions and consensus from ACVO diplomates, and must satisfy ourselves with terms like "presumed inherited" and "suspected to be inherited." Several companies provide information on genetic testing which greatly assists in providing more information and data to aid in defining the canine genetics of ocular diseases.

When do we suspect that a disorder is inherited in a given breed?

- When the frequency is greater than in other breeds
- When the frequency increases in a given breed as a whole
- When the frequency is greater in related dogs within a breed
- When it has a characteristic appearance and location
- When it has a characteristic age of onset and course of progression (predictable stages of development and time for each stage to develop)
- When it looks identical to an entity which has been proven to be inherited in another breed

Special thank you to the "Father of Veterinary Medical Genetics," Donald F. Patterson, DVM, DSc. Dr. Patterson, who died in 2013, was Emeritus Professor of Medicine and Medical Genetics, University of Pennsylvania School of Veterinary Medicine and Emeritus Professor of Human Genetics, University of Pennsylvania School of Medicine. These guidelines on the heritability of disorders in dogs are based on his lectures and publications.

Guidelines Used by the ACVO Genetics Committee in Making Breeding Recommendations

In this book, we chose the term "**BREEDING ADVICE**" and intentionally avoided the words "certifiable" and "registerable." The ACVO does not serve as a registry organization. Registry organizations operate independently of the ACVO and set their own standards for registration. However, the OFA does follow the guidelines set forth by the ACVO Genetics Committee in this publication. Any registry organization may use the information in this compendium and results of examinations performed by ACVO Diplomates in the registering of animals with regard to breeding suitability as they see fit.

It is important to recognize that the sensitivity of genetic disorder detection is greater when large numbers of dogs are examined. The extensive number of disorders listed in this book for some breeds may reflect the popularity of the breed and the numbers of animals evaluated. Conversely, the lack of disorders listed for other breeds often reflects only the paucity of examinations reported for each breed. For these reasons, the ACVO Genetics Committee strongly recommends annual evaluations of dogs of all breeds as the imperative first step in the control of hereditary ocular disorders. We would like to acknowledge the contribution of the Orthopedic Foundation for Animals (OFA) and Canine Eye Registration Foundation (CERF) for providing statistical summaries of ophthalmic examinations from their files.

For each breed, specific ocular disorders have been listed which are known or suspected to be inherited based on one or more of the following criteria:

1) There are published reports in the scientific literature regarding a condition in a particular breed with evidence of inheritance.

2) The incidence of affected animals (from OFA and CERF reports) is greater than or equal to 1% of the examined population with a minimum of five affected animals per five year period. Regardless of the population of dogs examined, if 50 or more affected individuals are identified in a five year period, the entity will be listed for that breed.

3) A specific request from a breed club that a condition be included for their breed may be considered at the ACVO annual meeting of the Genetics Committee if information is received by August 1. Such requests are reviewed critically and must include specific documentation as to the disorder in question and the numbers seen. Further information from the breed club may be requested. The request must receive agreement by a majority of the committee.

4) There is overwhelming opinion by a majority of the Genetics Committee members that clinical experience by ACVO Diplomates would indicate a particular condition should be listed for a breed, in spite of the absence of direct evidence of affected animals on OFA or CERF reports.

5) Results of genetic laboratory research and genetic testing.

The "Breeding Advice" given is determined by the significance of the condition to vision and/or very strong evidence of heritability:

Two categories of advice regarding breeding have been established:

> **NO**: Substantial evidence exists to support the heritability of this entity AND/OR the entity represents a potential compromise of vision or other ocular function.
>
> **BREEDER OPTION**: Entity is suspected to be inherited but does not represent potential compromise of vision or other ocular function.

When the breeding advice is "**NO,**" even a minor clinical form of the entity would make this animal unsuitable for breeding. When the advice is "**BREEDER OPTION,**" caution is advised. In time, it may be appropriate to modify this stand to "**NO**" based on accumulated evidence. If, in time, it becomes apparent that there is insufficient evidence that an entity is inherited, it may be deleted from the list.

There are currently eleven disorders for which there is an unequivocal recommendation <u>against</u> breeding in all breeds:

These are conditions which frequently result in blindness and for which there is definite evidence of heritability in one or more breeds. However, these disorders will not be listed on the individual breed page for a given breed, unless they also meet the criteria described above.

- **Keratoconjunctivitis sicca (KCS)** – Breeding is not recommended for any animal demonstrating keratitis consistent with KCS. The prudent approach is to assume KCS to be hereditary except in cases suspected to be non-genetic in origin. See *note.
- **Glaucoma** – See *note.
- **Persistent Pupillary Membranes**
    - **Iris to Lens**
    - **Iris to Cornea**
    - **Iris Sheets**
    - **Endothelial Opacity/No Strands**
- **Cataract** – Breeding is not recommended for any animal demonstrating partial or complete opacity of the lens or its capsule. See *note.
- **Lens luxation or subluxation** – See *note.
- **Persistent hyperplastic primary vitreous (PHPV)/persistent hyperplastic tunica vasculosa lentis (PHTVL)** – See *note.
- **Retinal detachment** – See *note.
- **Retinal atrophy – generalized (PRA)** - Breeding is not advised for any animal demonstrating bilaterally symmetric retinal degeneration (considered to be PRA unless proven otherwise).
- **Retinal dysplasia, geographic or detached forms** – See *note.
- **Optic nerve coloboma**
- **Optic nerve hypoplasia**

**Note: The prudent approach of these disorders is to assume they are hereditary except in cases specifically known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, or nutritional deficiencies.*

The following breeds are recommended to have a preliminary examination prior to initial pharmacological dilation to best facilitate identification of these disorders:

Dalmatian – iris hypoplasia/sphincter dysplasia
Australian Shepherd – iris coloboma
Miniature American Shepherd/Miniature Australian Shepherd – iris coloboma
Toy Australian Shepherd – iris coloboma
Mudi – iris hypoplasia/iris coloboma

What can be detected during an Eye Certification Examination?

A routine eye screening examination includes indirect ophthalmoscopy and slit lamp biomicroscopy following pharmacological dilation of the pupils. Gonioscopy, tonometry, Schirmer tear test, electroretinography, and ultrasonography are not routinely performed; thus, dogs with goniodysgenesis, glaucoma, keratoconjunctivitis sicca, or some early cases of progressive retinal atrophy might not be detected without further testing.

The diagnoses obtained during an ophthalmic eye certification examination refer only to the **phenotype** (clinical appearance) of an animal. Thus, it is possible for a clinically normal animal to be a carrier (abnormal **genotype**) of genetic abnormalities.

An individual ACVO Diplomate may disagree with the breeding advice contained in this compendium. It is appropriate for this examiner to contact the ACVO Genetics Committee to voice disagreement, initiate change, or suggest additions. The members of the Genetics Committee represent the ACVO but acknowledge that the information generated for a breed may not agree with the knowledge and clinical experience of every individual ACVO Diplomate.

What is the role of the responsible dog breeder?

The final beneficiary of the information in this book is the dog breeder. It is up to the conscientious breeder to use this information along with other criteria in selecting which animals to breed. To assist this determination, current certification is recommended. Animals currently free of heritable eye disease will be issued a certificate on receipt of the examination/application by OFA. To avoid confusion between a normal animal (no evidence of heritable eye disorders) and one that may have a minor fault coming under the advice of Breeder Option, the Breeder Option category will be printed on the certificate. This is intended to stimulate conversation as to the specific nature of the Breeder Option condition found in that particular animal, allowing breeders using a dog in a breeding program to make an informed decision.

There are many ocular conditions which are a direct result of selection for a facial conformation considered desirable by breeders.

These include:

- Entropion
- Ectropion
- Macroblepharon
- Exposure keratopathy syndrome

Facial conformation with excessively prominent eyes, heavy facial folds, or eyelids which are either inverted or everted predispose animals to corneal irritation, discomfort, and if left untreated, can lead to loss of vision. A responsible breeding program should recognize and select away from these exaggerated facial features.

THE ROLE OF GENETIC TESTING IN THE DETECTION OF OCULAR DISEASE

Genetic testing plays a very important role in the diagnosis of disease. However, it is important to be aware of the limitations of genetic testing and understand its role in the detection and control of genetically inherited diseases.

Genetically inherited diseases are caused by a deleterious sequence change (mutation) in the DNA that results in an abnormal protein (protein can be absent, have insufficient function, or have an abnormal function) that results in disease.

Genetic tests are developed by comparing the DNA sequence of a normal animal to that of an animal with disease. This allows the identification of a particular DNA sequence that can be causally associated with the disease. This is an extremely powerful tool that, in some cases, allows for identification of disease even before it is evident clinically.

However, a particular test is only capable of detecting the DNA sequence it was designed to detect. That is, the DNA test only tests for a specific change in the DNA that can cause disease. For example, a DNA test specific for the *PDE6B* gene mutation (responsible for the rcd1 form of PRA in the Irish Setter) will not detect any abnormalities in other breeds or mixed breeds that have other mutations in the same gene. Thus the specificity of a DNA test is also its limitation, and in the case of PRA in Irish Setters it is specific for the Irish Setter defect and not for any other defects.

In polygenic disorders, a genetic test cannot evaluate the integrity of all the proteins that make up a particular cellular process. Thus, it is possible for a DNA test that has been associated with a disease to be normal and yet the disease can still be present. The disease could be caused by an abnormality in one of the other genes that are involved with that particular cellular process. The defect in the other protein still results in an abnormal cellular process, which still results in disease. A perfect example of this is observed in oculo-skeletal dysplasia in Labrador Retrievers and Samoyed dogs. In both breeds the diseases are clinically identical, yet caused by mutations in different genes involved in fibril formation of a specific kind of collagen molecule.

Thus, obtaining a DNA test that is normal does not guarantee absence of disease. It only guarantees that the particular change the DNA test was designed to detect is not present, and that disease from that particular change will not occur. This is why genetic testing should be combined with ophthalmic examination for maximum efficacy. An ophthalmic exam evaluates the sum total or “result” of all the cellular processes required to maintain ocular health and result in vision, and is an essential part of the ocular wellness exam to ensure that other important clinically recognizable diseases are not present.

Breeder Option Codes

A – Eyelids

A1 Entropion
A2 Ectropion
A3 Distichiasis
A4 Ectopic Cilia
A6 Imperforate Lacrimal Punctum

B – Nicitans

B1 Cartilage Anomaly/Eversion
B2 Gland Prolapse

C – Cornea

C1 Corneal Dystrophy – Epithelial/Stromal
C2 Corneal Dystrophy – Endothelial
C4 Pigmentary Keratitis/Keratopathy

D – Uvea

D1a Uveal Cyst – Free Floating
D1b Uveal Cyst – Single
D1c Uveal Cyst – Multiple
D2 Iris Coloboma
D3 Persistent Pupillary Membranes – Iris to Iris
D4 Iris Hypoplasia

E – Lens

E1 Cataract – Suspect Not Inherited
E2 Posterior Y Tip Suture Opacities

F – Vitreous

F1 Persistent Hyaloid Artery
F2a Vitreous Degeneration – Syneresis
F2b Vitreous Degeneration – Anterior Chamber

G – Fundus

G1 Retinal Dysplasia – Folds
G5 Micropapilla
G6a CMR-Type Retinopathy
G6b Retinopathy

Glossary of Terms

(For more detailed definitions, the reader is referred to medical and genetic scientific texts.)

Achromatopsia: see **Day blindness**

Canine multifocal retinopathy: characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). The condition includes numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina with accumulation of material that produces gray-tan-pink colored lesions (multifocal bullous retinal detachments). These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs and might not progress or progress slowly, or may appear to heal with discrete areas of tapetal hyper-reflectivity or hyperpigmentation. Most dogs exhibit no noticeable problem with vision despite their abnormal appearing retinas.

Cataract: any opacity of the lens and/or its capsule, regardless of size or location within the lens. Cataracts are assumed to be hereditary unless associated with known trauma, ocular inflammation, specific metabolic diseases, or nutritional deficiencies.

Ceroid lipofuscinosis: an inherited disease of man and animals characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's disease.)

Choroidal hypoplasia: a congenital, inherited, non-progressive defect primarily affecting the choroid resulting in some or all of the following: decreased or lack of pigment in the retinal pigment epithelium or choroid, tapetal thinning, and reduced or abnormal choroidal blood vessels.

Chronic superficial keratitis (CSK): see **Pannus**

Collie eye anomaly: a congenital syndrome of ocular anomalies characterized by bilateral and often symmetrical defects including any combination of **choroidal hypoplasia**, **coloboma**, and **retinal detachment(s)**.

Coloboma: a congenital abnormality in ocular development usually characterized by focal absence of tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure.

Cone degeneration: the loss of photopic vision caused by selective degeneration of the cone photoreceptors. Also known as day blindness, hemeralopia, or achromatopsia.

Corneal degeneration: opacification of one or more of the corneal layers frequently resulting from deposition of lipid or mineral and occurring secondary to chronic inflammation.

Corneal dystrophy: non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers (**epithelium, stroma, endothelium**). The term dystrophy implies an inherited condition. It is usually bilateral although not necessarily symmetrical and the onset in one eye may precede the other.

> **Corneal dystrophy - endothelial:** breed-related loss or dysfunction of corneal endothelial cells resulting in bilateral, progressive corneal edema.

Corneal dystrophy - epithelial, stromal: breed-related, non-inflammatory, white to silver-colored opacification of the corneal epithelium and/or stroma frequently resulting from deposition of lipid.

Day blindness: see **Cone degeneration**

Dental-skeletal-retinal anomaly (DSRA): Dental-Skeletal-Retinal-Anomaly (DSRA) is a syndromic condition documented in the Cane Corso. This condition is associated with a MIA3 splice defect that has been identified in all affected dogs with an autosomal recessive inheritance pattern. Clinically affected dogs present with dwarfism, dental abnormalities including loss of enamel and tooth discoloration, as well as early onset retinal atrophy.

Dermoid: a congenital, non-cancerous growth occurring on the cornea, conjunctiva, or eyelid typified by the presence of skin-like structures.

Distichiasis: the presence of abnormally oriented eyelashes, frequently protruding from Meibomian gland ductal openings.

Dry eye: see **Keratoconjunctivitis sicca**

Dysplasia: abnormality of development.

Dystrophy: non-inflammatory, developmental, nutritional, or metabolic abnormality; dystrophy implies a possible hereditary basis and is usually bilateral.

Ectopic cilia: aberrant hairs emerging through the palpebral conjunctiva which often causes ocular discomfort and corneal disease.

Ectropion: a conformational defect resulting in eversion of the eyelid margin, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several factors defining the skin and other structures, which make up the eyelids, orbital contents, and conformation of the skull.

Entropion: a conformational defect resulting in inversion of the eyelid margin which may cause ocular irritation. It is likely that entropion is influenced by several factors defining the skin and other structures, which make up the eyelids, orbital contents, and conformation of the skull.

Euryblepharon: an exceptionally long eyelid marginal length, which may lead to Ectropion or Entropion. Euryblepharon is synonymous with the term macropalpebral fissure.

Exposure/pigmentary keratitis: a condition characterized by variable degrees of superficial vascularization, fibrosis, and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos, and macropalpebral fissure.

Glaucoma: characterized by an elevation of intraocular pressure (IOP) which causes optic nerve and retinal degeneration and results in blindness. Diagnosis and classification of glaucoma requires tonometry and gonioscopy, which are not part of a routine eye certification examination.

Glaucoma, pigmentary: see O**cular melanosis**

Goniodysgenesis: congenital anomaly characterized by the persistence of a variably fenestrated sheet of uveal tissue spanning the iridocorneal angle, extending from the iris base to the peripheral cornea.

Diagnosis is by gonioscopy, which is not part of a routine eye certification examination.

Hemeralopia: see **Cone degeneration**

Imperforate lacrimal punctum: developmental anomaly resulting in an imperforate opening of the lacrimal puncta. An imperforate lower punctum may result in epiphora, an overflow of tears onto the face.
Iridocorneal angle: the junction between the iris and the cornea; the drainage angle. Aqueous humor leaves the anterior chamber via the trabecular meshwork within the iridocorneal angle into the venous circulation.

Iris coloboma: a congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the eye certification form.

Iris cyst: see **Uveal cyst**

Iris hypoplasia: a congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the eye certification form.

Iris melanoma: see **Uveal melanoma**

Iris sphincter dysplasia: a congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue at the level of the iris sphincter, causing pupillary dilation. This abnormality has been noted in the Dalmatian breed.

Keratitis: inflammation of the cornea.

Keratitis, punctate: inflammation of the cornea accompanied by multifocal, coalescing areas of stromal corneal ulceration of variable depth.

Keratoconjunctivitis sicca (KCS): an abnormality of the tear film attributed to deficiency of the aqueous portion of the tears. Progressive KCS may result in ocular surface irritation and/or vision impairment via corneal opacification. Also called dry eye. The test for this condition is the Schirmer Tear Test, which is not part of a routine eye certification examination.

Lens subluxation/luxation: partial (subluxation) or complete displacement of the lens from the normal anatomic site. Lens luxation may result in elevated intraocular pressure (secondary glaucoma), causing vision impairment, pain, and/or retinal detachment.

Lenticonus: an anomaly of the lens in which the anterior or posterior surface protrudes in a conical form; usually congenital.

Macroblepharon: an exceptionally large palpebral fissure. Macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

Merle: an incompletely dominant phenotype in which heterozygous (M/m) dogs exhibit a coat color phenotype of various dilute color patches, while homozygous (M/M) dogs exhibit marked hypopigmentation and ocular defects, including microphthalmia, blindness and colobomas, and deafness. Deafness and

ocular defects are sometimes seen in heterozygous individuals.

Micropapilla: a congenital anomaly which results in a small optic disk diameter without vision loss. Contrast with optic nerve hypoplasia, which may have a similar ophthalmoscopic appearance with vision loss.

Microphakia: a congenital anomaly in which there is an abnormally small lens.
Microphthalmos: a congenital anomaly in which the globe is abnormally small. Commonly associated with multiple ocular malformations and when severe, may affect vision.

Nictitans cartilage anomaly/eversion: a congenital anomaly in the nictitating membrane in which the T-shaped cartilage is malformed and/or folded.

Nictitans gland prolapse: protrusion of the tear-producing gland of the nictitating membrane from its normal position posterior to the nictitating membrane, to a position superior to the free margin of this structure.

Nodular granulomatous episclerokeratitis (NGE): an inflammatory disorder of the sclera and episclera, with occasional corneal involvement, characterized by granulomatous infiltrates. Previously known as **Proliferative keratoconjunctivitis**. This condition is most commonly seen in the Collie.

Nyctalopia: loss of scotopic (night) vision. Causes include genetic defects in photoreceptors and in retinal pigment epithelium, either dystrophy or degeneration of affected cells.

Ocular melanosis: progressive bilateral and sometimes asymetrical increase in pigmentation with melanocytic accumulation the uveal tract and adjacent tissues. Ultimately progresses to glaucoma and loss of vision in most cases (melanocytic glaucoma). Not associated with systemic disease or metastases. Most often recognized in Cairn Terriers.

Optic nerve coloboma: a congenital abnormality of the optic nerve commonly associated with failure of closure of the optic fissure, resulting in a defect in the optic nerve in the anterior-posterior plane. May result in partial or total vision loss.

Optic nerve hypoplasia: a congenital anomaly, which results in a small optic disk diameter and vision loss. Contrast with micropapilla, which may have a similar ophthalmoscopic appearance but without loss of vision.

Pannus: a bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the inferior or inferiotemporal cornea, followed by the formation of a vascularized subepithelial opacity that begins to spread toward the central cornea; pigmentation may follow the vascularization. If severe, vision impairment occurs. Plasma cell infiltration of the nictitans may occur in conjunction with CSK, or on its own. (Also called “CSK”.)

Persistent hyaloid artery (PHA): congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

Persistent hyperplastic primary vitreous (PHPV): congenital defect resulting from abnormalities in the regression of the hyaloid artery (the primary vitreous) and the interaction of the blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with congenital cataracts and frequently seen with PHTVL.

Persistent hyperplastic tunica vasculosa lentis (PHTVL): congenital defect resulting from failure of regression of the embryonic vascular network which surrounds the developing lens. Often associated with PHPV and a patent hyaloid artery.

Persistent pupillary membranes (PPM): persistent blood vessel remnants in the anterior chamber which fail to regress normally by 3 months of age. These strands arise from the iris collaret and may bridge from iris to iris, iris to lens, iris to cornea, or form sheets of tissue in the anterior chamber.

Persistent tunica vasculosa lentis (PTVL): clinically insignificant posterior epicapsular lenticular opacities resulting from incomplete regression of the embryonic vascular network which surrounds the developing lens.

Pigmentary glaucoma: see **Ocular melanosis**

Pigmentary uveitis: see **Uveitis, pigmentary**

Pigmentary keratopathy: a condition reported in Pugs in which the cornea becomes pigmented, often resulting in vision impairment. Development of pigmentary keratopathy is associated with congenital uveal pathology – iris hypoplasia and the presence of persistent pupillary membranes – but not with other factors such as Schirmer tear test values or medial canthal entropion.

Plasmoma: see **Pannus**. Also called Atypical Pannus. Bilateral thickening and depigmentation of the nictitans due to invasion of lymphocytes and plasma cells. It may or may not be associated with corneal involvement (Pannus).

Progressive rod-cone degeneration (PRCD) (see also **PRA**): Typically refers to recessively inherited generalized loss of rod photoreceptors followed by cone degeneration. Many different genetic mutations result in a similar phenotypic presentation.

Progressive retinal atrophy (PRA): an umbrella term used to describe a group of inherited dysplastic, dystrophic, or degenerative diseases of the retinal visual cells (photoreceptors, retinal pigment epithelium, or both).

Proliferative keratoconjunctivitis: see **Nodular granulomatous episclerokeratitis**

Retinal atrophy: a non-specific term used to describe a decrease in the number and deterioration of the cells of the retina, regardless of cause.

Retinal degeneration: see **Retinal atrophy**

Retinal detachment: a separation of the neurosensory retina from the retinal pigment epithelium.

Retinal dysplasia: abnormal development of the retina present at birth. This condition is non-progressive and recognized in 3 forms: **folds**, **geographic**, **detached**.

> **Retinal dysplasia – folds:** seen ophthalmoscopically as linear, triangular, curved or curvilinear foci of retinal folding. May be single or multiple. In puppies, retinal folds can be seen as a transient phenomenon, resolving as the eye retains maturity.
>
> **Retinal dysplasia – geographic:** an irregularly shaped area of retinal development containing both areas of thinning and areas of elevation. This form may be associated with visual impairment.

Retinal dysplasia – detached: severe retinal disorganization associated with separation of the neurosensory retina from the retinal pigmented epithelium. This form results in visual impairment.

Retinopathy: any non-inflammatory condition of the retina. These conditions can usually be detected by ophthalmoscopic examination, but an electroretinogram (ERG) may be required in some instances (e.g. canine multifocal retinopathy).

Rod-cone dysplasia: an inherited retinal disease characterized by abortive or abnormal development of rods and cones. Affected animals become blind early in life, usually within the first 6 months, with the exception of *rcd4* in the Gordon and Irish Setter dogs. See specific breed pages for rod-cone dysplasia type descriptions.

Rod dysplasia: abnormal development of the visual cells resulting in vision impairment in dim light by 6 months and total blindness at 3-5 years.

Uveal cyst: a pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions in various breeds.

Uveal cyst, anterior chamber: a pigmented, fluid-filled, epithelial-lined structure arising from the posterior iris or ciliary body epithelium which has detached from its site of origin and is free-floating in the anterior chamber.

Uveal cyst, ciliary body: a pigmented, fluid-filled, epithelial-lined structure arising from the ciliary body epithelium and attached to the ciliary body.

Uveal cyst, iris: a pigmented, fluid-filled, epithelial-lined structure arising from the posterior iris epithelium and attached to the iris.

Uveal melanoma: a locally invasive melanocytic neoplasm arising within the uveal tract, may be benign (melanocytoma) or malignant (malignant melanoma). Uveal melanomas are reported in higher frequency in German Shepherd Dogs and Labrador Retrievers. Inherited iris melanoma has been reported in Labrador Retrievers.

Uveitis, pigmentary: a specific form of uveitis most commonly seen in middle-aged to older Golden Retrievers. Clinically manifests early as pigment deposition in a radial fashion on the anterior lens capsule with iridociliary cysts. Later stages are associated with posterior synechia, fibrinous anterior uveitis, cataract, and ultimately glaucoma. Not associated with systemic disease; may be asymmetric in presentation.

Uveodermatologic syndrome: an immune-mediated syndrome of anterior uveitis, chorioretinitis, dermal depigmentation (vitiligo), and hair depigmentation (poliosis). A similar syndrome in humans, called Vogt-Koyanagi-Harada syndrome (VKH), is an autoimmune disease directed against melanocytes. Secondary glaucoma and/or retinal detachment are frequent complications of this disease. Seen most commonly in the Akita, Samoyed, and Siberian Husky breeds.

Vitreous degeneration: Liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

Y-suture tip opacity: These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.

AFFENPINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder Option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
AFFENPINSCHER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 411 #	%	2018-2022 151 #	%
GLOBE				
.110 MICROPHTHALMIA	1	0.2%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.2%	2	1.3%
25.110 DISTICHIASIS	21	5.1%	5	3.3%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.7%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.2%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	0	0.0%	2	1.3%
70.700 CORNEAL DYSTROPHY	7	1.7%	6	4.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	33	8.0%	15	9.9%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	1.2%	1	0.7%
LENS				
100.200 CATARACT, UNSPECIFIED	3	0.7%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	1.9%	1	0.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	2	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.2%	1	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.2%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.2%	2	1.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	3	0.7%	1	0.7%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.7%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	1	0.2%	2	1.3%
100.330 GENERALIZED/ COMPLETE CATARACT	3	0.7%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***14***	***3.4%***	***7***	***4.6%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.7%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	2	0.5%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	0.5%	0	0.0%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	1	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	3	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	8	1.9%	1	0.7%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	0.5%	3	2.0%
NORMAL				
.000 NORMAL GLOBE	342	83.2%	116	76.8%

AFGHAN HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1, 2	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
D.	Cataract	Not defined	1, 3	NO
E.	Y-suture tip opacity	Not defined	1	Breeder Option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

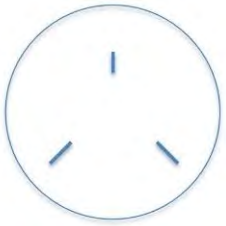
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The characteristic cataract in the Afghan Hound begins as equatorial lens vacuoles in dogs from 4 months

to 2 years of age. The opacities then extend into the anterior and posterior cortices. Rapid progression can occur with visual impairment in young adults. Test breedings have been done which support a hereditary basis; however, the exact mode of inheritance is unknown.

E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Vainisi SJ, Goldberg MF. *Animal models of inherited disease. In: Genetic and Metabolic Eye Disease* Little Brown and Company, Boston, 1974.

3. Roberts SR, Helper LC. Cataracts in Afghan hounds. *J Am Vet Med Assoc*. 1972; 160: 427. PMID: 5014602

OCULAR DISORDERS REPORT
AFGHAN HOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,331 #	%	2018-2022 415 #	%
GLOBE				
.110 MICROPHTHALMIA	1	0.0%	0	0.0%
10.000 GLAUCOMA	2	0.1%	0	0.0%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	2	0.1%	0	0.0%
25.110 DISTICHIASIS	28	1.2%	2	0.5%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	0.0%	1	0.2%
CORNEA				
70.210 PANNUS	3	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY	248	10.6%	58	14.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	3	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	4	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	67	2.9%	14	3.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	1	0.2%
93.810 UVEAL MELANOMA	0	0.0%	1	0.2%
FUNDUS				
97.120 COLOBOMA	2	0.1%	0	0.0%
130.110 MICROPAPILLA	0	0.0%	2	0.5%
LENS				
100.200 CATARACT, UNSPECIFIED	9	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	138	5.9%	30	7.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	6	0.3%	10	2.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.1%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	34	1.5%	17	4.1%
100.306 PUNCTATE CATARACT, NUCLEUS	6	0.3%	6	1.4%
100.307 PUNCTATE CATARACT, CAPSULAR	8	0.3%	3	0.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	5	0.2%	3	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	4	0.2%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.1%	1	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	13	0.6%	1	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS	3	0.1%	2	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	3	0.1%	1	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	2	0.1%	0	0.0%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	3	0.1%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES	23	1.0%	33	8.0%
100.330 GENERALIZED/ COMPLETE CATARACT	2	0.1%	0	0.0%

OCULAR DISORDERS REPORT
AFGHAN HOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,331 #	 %	Year Examined: 2018-2022 Total # Dogs: 415 #	 %
LENS Continued				
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***116***	***5.0%***	***45***	***10.8%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.0%	2	0.5%
110.135 PHPV/ PTVL	1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	6	0.3%	1	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS	7	0.3%	1	0.2%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	6	0.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	9	0.4%	0	0.0%
120.960 RETINOPATHY	3	0.1%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	0	0.0%	1	0.2%
130.150 OPTIC DISC COLOBOMA	3	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	20	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	34	1.5%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	24	1.0%	23	5.5%
NORMAL				
.000 NORMAL GLOBE	1,838	78.9%	272	65.5%

AIREDALE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
	- endothelial opacity/no strands	Not defined	1	NO
C.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
AIREDALE TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 842 #	 %	2018-2022 138 #	 %
GLOBE				
.110 MICROPHTHALMIA	3	0.4%	0	0.0%
10.000 GLAUCOMA	0	0.0%	1	0.7%
EYELIDS				
20.140 ECTOPIC CILIA	2	0.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	4	0.5%	0	0.0%
25.110 DISTICHIASIS	58	6.9%	12	8.7%
CORNEA				
70.210 PANNUS	1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY	9	1.1%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	3	0.4%	0	0.0%
UVEA				
93.120 IRIS CYST	1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	30	3.6%	3	2.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	8	1.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	22	2.6%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	7	0.8%	4	2.9%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.6%	5	3.6%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	0.1%	0	0.0%
FUNDUS				
97.120 COLOBOMA	1	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	1.4%
LENS				
100.200 CATARACT, UNSPECIFIED	7	0.8%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	55	6.5%	7	5.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	10	1.2%	5	3.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	6	0.7%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.2%	2	1.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	8	1.0%	2	1.4%
100.306 PUNCTATE CATARACT, NUCLEUS	4	0.5%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	3	0.4%	1	0.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	9	1.1%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	9	1.1%	1	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.8%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	5	0.6%	1	0.7%
100.316 INCIPIENT CATARACT, NUCLEUS	2	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	3	0.4%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.7%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.7%
100.328 Y-SUTURE TIP OPACITIES	1	0.1%	2	1.4%
100.330 GENERALIZED/ COMPLETE CATARACT	4	0.5%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	0	0.0%	1	0.7%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***80***	***9.5%***	***14***	***10.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	4	0.5%	1	0.7%
110.135 PHPV/ PTVL	1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	7	0.8%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	21	2.5%	1	0.7%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	9	1.1%	0	0.0%

OCULAR DISORDERS REPORT
AIREDALE TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 842 #	 %	2018-2022 138 #	 %
RETINA Continued				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	12	1.4%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	0	0.0%	1	0.7%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.7%
OTHER				
900.000 OTHER, UNSPECIFIED	8	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	35	4.2%	1	0.7%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	20	2.4%	9	6.5%
NORMAL				
.000 NORMAL GLOBE	612	72.7%	95	68.8%

AKBASH DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AKBASH DOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
AKBASH DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 39 #	 %	Year Examined: 2018-2022 Total # Dogs: 0 #	 %
GLOBE				
.110 MICROPHTHALMIA	1	2.6%	0	
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	3	7.7%	0	
22.000 ECTROPION, UNSPECIFIED	1	2.6%	0	
UVEA				
93.120 IRIS CYST	2	5.1%	0	
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	5.1%	0	
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	2.6%	0	
100.316 INCIPIENT CATARACT, NUCLEUS	1	2.6%	0	
100.330 GENERALIZED/ COMPLETE CATARACT	1	2.6%	0	
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***3***	***7.7%***	***0***	
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	2.6%	0	
NORMAL				
.000 NORMAL GLOBE	32	82.1%	0	

AKITA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	2	NO
B.	Entropion	Not defined	1, 3	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
F.	Cataract	Not defined	1	NO
G.	Y-suture tip opacity	Not defined	1	Breeder option
H.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
I.	Uveodermatologic syndrome	Not defined	4-13	NO

Description and Comments

A. Microphthalmia with multiple ocular defects

Multiple ocular defects consisting of small eye (microphthalmia), opacity of the lens (cataract), conical shape of the posterior lens (posterior lenticonus), and folding of the retina into rosettes (retinal dysplasia) have been reported in related Akita pups. Cataracts affected primarily the nuclear and cortical lens. Retinal dysplasia affected the superior retina overlying the tapetal fundus. Affected dogs may have severe visual dysfunction. An autosomal recessive mode of inheritance is suspected but not proven.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. OFA data indicates that entropion in the Akita usually occurs by 2 years of age.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make strong recommendations with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Corneal Dystrophy

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Akita, many of these strands bridge between the iris and lens, thus resulting in focal cataract and possible vision impairment.

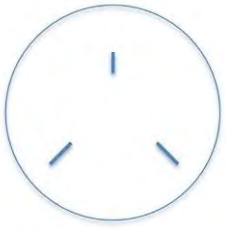
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

F. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies.

G. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which

should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and the more severe forms of retinal dysplasia is undetermined.

I. Uveodermatologic syndrome

Uveodermatologic syndrome in the Akita bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. The genetics of this condition are unclear, but some genetic predisposition is indicated by the higher prevalence of this disorder in Akitas compared with other dog breeds. Affected dogs are generally young, ranging in age between 1 ½ to 4 years.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Laratta LJ, Riis RC, Kern TJ, et al. Multiple congenital ocular defects in the Akita dog. *Cornell Vet*. 1985;75:381-392. PMID: 3926378

3. Startup FG. Hereditary eye problems in the Japanese Akita. *Vet Rec*. 1986;118:251. PMID: 3705415

4. Asakura S, Takahasi K, Onishi T. Vogt-Koyanagi-Harada syndrome (uveitis diffusa acuta) in the dog. *Japanese J Vet Med*. 1977;673:445-455.

5. Romatowski J. A uveodermatological syndrome in an Akita dog. *J Am Anim Hosp Assoc*. 1985;21.

6. Campbell KL, McLaughlin SA, Reynolds HA. Generalized leukoderma and poliosis following uveitis in a dog. *J Am Anim Hosp Assoc*. 1986;22:121-124.

7. Cottrell BD, Barnett KC. Harada disease in the Japanese Akita. *J Small Anim Pract*. 1987;28:517-521. **reference derived from non-USA dog population**

8. Bellhorn RW, Murphy CL, Thirkill CE. Antiretinal immunoglobulins in canine ocular diseases. *Semin Vet Med Surg*. 1988;3:28-32. PMID: 3363244

9. Murphy CJ, Bellhorn RW. Anti-retinal antibodies associated with Vogt-Koyanagi-Harada-like syndrome in a dog. *J Am Anim Hosp Assoc*. 1989;27:399-402.

10. Morgan RV. Vogt-Koyanagi-Harada syndrome in humans and dogs. *Comp Cont Educ Pract Vet*. 1989;11:1211-1217.

11. Lindley DM, Boosinger TR, Cox NR. Ocular histopathology of Vogt-Koyanagi-Harada-like

syndrome in an Akita dog. Vet Pathol. 1990 Jul;27(4):294-6. doi: 10.1177/030098589002700415. PMID: 2402857.

12. Angles JM, Famula TR, Pedersen NC. Uveodermatologic (VKH-like) syndrome in American Akita dogs is associated with an increased frequency of DQA1*00201. Tissue Antigens. 2005 Dec;66(6):656-65. doi: 10.1111/j.1399-0039.2005.00508.x. PMID: 16305682.

13. Yamaki K, Takiyama N, Itho N, Mizuki N, Seiya M, Sinsuke W, Hayakawa K, Kotani T. Experimentally induced Vogt-Koyanagi-Harada disease in two Akita dogs. Exp Eye Res. 2005 Feb;80(2):273-80. doi: 10.1016/j.exer.2004.09.010. PMID: 15670805. **reference derived from non-USA dog population**

OCULAR DISORDERS REPORT
AKITA

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	11,085		818	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	34	0.3%	6	0.7%
10.000	GLAUCOMA	2	0.0%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	107	1.0%	10	1.2%
22.000	ECTROPION, UNSPECIFIED	15	0.1%	1	0.1%
25.110	DISTICHIASIS	72	0.6%	11	1.3%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	7	0.1%	3	0.4%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	7	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	59	0.5%	8	1.0%
UVEA					
93.120	IRIS CYST	1	0.0%	0	0.0%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	274	2.5%	33	4.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	37	0.3%	2	0.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	26	0.2%	2	0.2%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	3	0.0%	1	0.1%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	12	0.1%	9	1.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.0%	2	0.2%
LENS					
100.200	CATARACT, UNSPECIFIED	28	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	251	2.3%	13	1.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	9	0.1%	2	0.2%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	9	0.1%	1	0.1%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.0%	1	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.0%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	50	0.5%	12	1.5%
100.306	PUNCTATE CATARACT, NUCLEUS	3	0.0%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	16	0.1%	6	0.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	11	0.1%	1	0.1%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	39	0.4%	1	0.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	10	0.1%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	18	0.2%	2	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	7	0.1%	2	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	11	0.1%	2	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	2	0.2%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	13	0.1%	13	1.6%
100.330	GENERALIZED/ COMPLETE CATARACT	26	0.2%	2	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***247***	***2.2%***	***37***	***4.5%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	19	0.2%	1	0.1%
110.135	PHPV/ PTVL	5	0.0%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	8	0.1%	1	0.1%

OCULAR DISORDERS REPORT
AKITA

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 11,085 #	 %	Year Examined: 2018-2022 Total # Dogs: 818 #	 %
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	3	0.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	208	1.9%	9	1.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	22	0.2%	4	0.5%
120.190 RETINAL DYSPLASIA, DETACHED	4	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	90	0.8%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	6	0.1%	0	0.0%
120.960 RETINOPATHY	0	0.0%	1	0.1%
120.970 CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.1%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	8	0.1%	1	0.1%
130.150 OPTIC DISC COLOBOMA	2	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	52	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED	177	1.6%	2	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	102	0.9%	25	3.1%
NORMAL				
.000 NORMAL GLOBE	9,874	89.1%	663	81.1%

ALANO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ALANO breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
ALANO

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	1		0	
Diagnostic Name	**#**	**%**	**#**	**%**
NORMAL				
.000 NORMAL GLOBE	1	100.0%	0	

ALAPAHO BLUE-BLOOD BULLDOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ALAPAHO BLUE-BLOOD BULLDOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
ALAPAHA BLUE-BLOOD BULLDOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		1	
Diagnostic Name		#	%	#	%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	100.0%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	0	0.0%	1	100.0%

ALASKAN KLEE KAI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
ALASKAN KLEE KAI

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	727		207	
	Diagnostic Name	#	%	#	%
EYELIDS					
25.110	DISTICHIASIS	51	7.0%	9	4.3%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	3	0.4%	1	0.5%
CORNEA					
70.220	PIGMENTARY KERATITIS	1	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	12	1.7%	2	1.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.3%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	9	1.2%	2	1.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	5	0.7%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	18	2.5%	6	2.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	7	1.0%	2	1.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.3%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.4%	3	1.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	9	1.2%	2	1.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***24***	***3.3%***	***8***	***3.9%***
VITREOUS					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	8	1.1%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	5	0.7%	0	0.0%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.5%
OTHER					
900.000	OTHER, UNSPECIFIED	6	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	4	0.6%	1	0.5%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	12	1.7%	5	2.4%
NORMAL					
.000	NORMAL GLOBE	627	86.2%	182	87.9%

ALASKAN MALAMUTE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Cone degeneration - day blindness	Autosomal recessive	2-8	NO	Mutation in the *CNGB3* gene

Descriptions and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Cone degeneration - day blindness or hemeralopia

Autosomal recessively inherited early degeneration of the cone photoreceptors. Affected puppies develop day-blindness, color blindness, and photophobia between 8 and 12 weeks of age. Affected dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. Genetically, the condition results from a deletion in the *CNGB3* gene. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Rubin LF, Bourns TKR, Lord LH. Hemeralopia in Dogs: Heredity of Hemeralopia in Alaskan Malamutes. *Am J Vet Res*. 1967;28:355-7. PMID: 5298491

3. Rubin LF. Clinical Features of Hemeralopia in Adult Alaskan Malamute. *J Am Vet Med Assoc*. 1971;158:1696-8. PMID: 5314319

4. Rubin LF. Hemeralopia in Alaskan Malamute Pups. *J Am Vet Med Assoc*. 1971;158:1699-701. PMID: 5314320

5. Aguirre GD, Rubin LF. Pathology of hemeralopia in the Alaskan malamute dog. *Invest Ophthalmol*. 1974;13:231-235. PMID: 4544344

6. Aguirre GD, Rubin LF. The electroretinogram in dogs with inherited cone degeneration. *Invest Ophthalmol*. 1975;14:840-847. PMID: 1081095

7. Seddon JM, Hampson ECGM, Smith RIE, et al. Genetic heterogeneity of day blindness in Alaskan Malamute. *Anim Genet*. 2006;37:407-410. PMID: 16879359 **reference derived from non-USA dog population**

8. Sidjanin DJ, Lowe JK, McElwee JL, et al. Canine CNGB3 mutations establish cone degeneration as orthologous to the human achromatopsia locus ACHM3. *Hum Mol Genet*. 2002;11:1823-1833. PMID: 12140185

OCULAR DISORDERS REPORT
ALASKAN MALAMUTE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 9,204 #	%	2018-2022 970 #	%
GLOBE				
.110 MICROPHTHALMIA	2	0.0%	0	0.0%
10.000 GLAUCOMA	2	0.0%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	5	0.1%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110 DISTICHIASIS	205	2.2%	15	1.5%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	2	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	77	0.8%	14	1.4%
UVEA				
93.120 IRIS CYST	6	0.1%	3	0.3%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150 IRIS COLOBOMA	3	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	0	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	590	6.4%	82	8.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	39	0.4%	4	0.4%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	12	0.1%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	4	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	9	0.1%	10	1.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.0%	0	0.0%
93.810 UVEAL MELANOMA	2	0.0%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	3	0.0%	0	0.0%
97.120 COLOBOMA	1	0.0%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	125	1.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	368	4.0%	48	4.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	29	0.3%	13	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	149	1.6%	11	1.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	24	0.3%	5	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	20	0.2%	3	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	74	0.8%	8	0.8%
100.306 PUNCTATE CATARACT, NUCLEUS	20	0.2%	6	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR	44	0.5%	16	1.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	30	0.3%	5	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	372	4.0%	36	3.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	44	0.5%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	8	0.1%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	81	0.9%	6	0.6%
100.316 INCIPIENT CATARACT, NUCLEUS	23	0.2%	3	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR	49	0.5%	8	0.8%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	2	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	22	0.2%	8	0.8%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%

OCULAR DISORDERS REPORT
ALASKAN MALAMUTE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	9,204		970	
	Diagnostic Name	#	%	#	%
LENS Continued					
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	3	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	3	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	4	0.0%	2	0.2%
100.328	Y-SUTURE TIP OPACITIES	11	0.1%	3	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	81	0.9%	1	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	7	0.1%	1	0.1%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***1,210***	***13.1%***	***136***	***14.0%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	10	0.1%	4	0.4%
110.135	PHPV/ PTVL	6	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	1	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	12	0.1%	1	0.1%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	60	0.7%	1	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	20	0.2%	1	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	18	0.2%	0	0.0%
120.400	RETINAL HEMORRHAGE	2	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	10	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.1%
120.960	RETINOPATHY	1	0.0%	1	0.1%
OPTIC NERVE					
130.110	MICROPAPILLA	3	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	9	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	2	0.0%	2	0.2%
OTHER					
900.000	OTHER, UNSPECIFIED	75	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	259	2.8%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	126	1.4%	41	4.2%
NORMAL					
.000	NORMAL GLOBE	7,223	78.5%	706	72.8%

ALASKAN NOBLE COMPANION DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ALASKAN NOBLE COMPANION DOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
ALASKAN NOBLE COMPANION DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 71 #	 %	Year Examined: 2018-2022 Total # Dogs: 19 #	 %
UVEA				
93.170 ANTERIOR CHAMBER CYST	1	1.4%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	5	7.0%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	1.4%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	1.4%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***1.4%***	***0***	***0.0%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	1.4%	0	0.0%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	5.3%
NORMAL				
.000 NORMAL GLOBE	66	93.0%	18	94.7%

AMERICAN ALSATIAN

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN ALSATIAN breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
AMERICAN ALSATIAN

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		2	
Diagnostic Name		#	%	#	%
NORMAL					
.000	NORMAL GLOBE	1	100.0%	2	100.0%

AMERICAN BANDOGGE MASTIFF

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN BANDOGGE MASTIFF breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
AMERICAN BANDOGGE MASTIFF

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		0	
Diagnostic Name		#	%	#	%
NORMAL					
.000 NORMAL GLOBE		1	100.0%	0	

AMERICAN BULLDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	2	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Multifocal retinopathy - *cmr1*	Autosomal recessive	3	NO (Breeder option with Normal DNA test for CMR)	Mutation in the *BEST1* gene

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

American Bulldogs with glaucoma were reported to have uveal cysts (evident on ophthalmic exam, ultrasound biomicroscopy and/or histopathology), goniodysgenesis, and anterior segment inflammation. Consistent clinical findings among reported individuals included an absent menace response, diminished to absent light perception, mydriasis, and elevated intraocular pressures.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas. A DNA test is available.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Pumphrey SA, Pizzirani S, Pirie CG, et al. Glaucoma associated with uveal cysts and goniodysgenesis in American Bulldogs: a case series. *Vet Ophthalmol*. 2013 Sep; 16(5):377-85. PMID: 23110479

3. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci.* 2007 May;48:1959-1967. PMID: 17460247

OCULAR DISORDERS REPORT
AMERICAN BULLDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 139 #	 %	Year Examined: 2018-2022 Total # Dogs: 13 #	 %
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	3	2.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	9	6.5%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	2	1.4%	0	0.0%
25.110 DISTICHIASIS	31	22.3%	1	7.7%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	4	2.9%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	1	0.7%	0	0.0%
UVEA				
93.120 IRIS CYST	1	0.7%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	0	0.0%	1	7.7%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	5	3.6%	1	7.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.7%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.7%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	7.7%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	1.4%	1	7.7%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.7%	1	7.7%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***0.7%***	***1***	***7.7%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	3	2.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	16	11.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.7%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	97	69.8%	10	76.9%

AMERICAN BULLY

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN BULLY breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
AMERICAN BULLY

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 18 #	 %	2018-2022 198 #	 %
EYELIDS				
25.110 DISTICHIASIS	1	5.6%	6	3.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	5.6%	1	0.5%
UVEA				
93.110 IRIS HYPOPLASIA	0	0.0%	1	0.5%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	5.6%	8	4.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	3	1.5%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	11.1%	4	2.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	2	1.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	11.1%	2	1.0%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	0.5%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.5%
100.328 Y-SUTURE TIP OPACITIES	1	5.6%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***2***	***11.1%***	***7***	***3.5%***
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	3	1.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.5%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	5.6%	0	0.0%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	5.6%	4	2.0%
NORMAL				
.000 NORMAL GLOBE	12	66.7%	164	82.8%

AMERICAN ENGLISH COONHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN ENGLISH COONHOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
AMERICAN ENGLISH COONHOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2		3	
Diagnostic Name		#	%	#	%
NORMAL					
.000	NORMAL GLOBE	2	100.0%	3	100.0%

AMERICAN ESKIMO DOG

(all varieties)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Lens luxation	Autosomal recessive	2	NO	Mutation in the *ADAMTS17* gene
C.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- *prcd*	Autosomal recessive	3, 4	NO	Mutation in the *prcd* gene

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

C. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Studies have shown that the principal form of PRA in the American Eskimo is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. However, in the American Eskimo Dog the phenotype can be very variable in the age of onset. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically

with signs of night blindness followed by day blindness. A DNA test is available.

Other forms of retinal degeneration that are not *prcd* are recognized in the breed. The currently available genetic test will not detect these other forms of PRA.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384. PMID: 22050825

3. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

4. Moody JA, Famula TR, Sampson RC, Murphy KE. Identification of microsatellite markers linked to progressive retinal atrophy in American Eskimo Dogs. Am J Vet Res. 2005 Nov;66(11):1900-2. doi: 10.2460/ajvr.2005.66.1900. PMID: 16334947.

OCULAR DISORDERS REPORT
AMERICAN ESKIMO DOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2,497		244	
	Diagnostic Name	#	%	#	%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	4	0.2%	1	0.4%
25.110	DISTICHIASIS	18	0.7%	1	0.4%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	9	0.4%	3	1.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	4	0.2%	0	0.0%
UVEA					
93.120	IRIS CYST	4	0.2%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	21	0.8%	2	0.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.0%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.2%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	4	0.2%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	3	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	141	5.6%	15	6.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	31	1.2%	6	2.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	10	0.4%	3	1.2%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	9	0.4%	3	1.2%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	9	0.4%	3	1.2%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.2%	2	0.8%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.1%	1	0.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	27	1.1%	7	2.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	24	1.0%	3	1.2%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	14	0.6%	2	0.8%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	5	0.2%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	3	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	7	0.3%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	7	0.3%	2	0.8%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.4%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	2	0.8%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	4	0.2%	6	2.5%
100.330	GENERALIZED/ COMPLETE CATARACT	10	0.4%	1	0.4%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***174***	***7.0%***	***36***	***14.8%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	7	0.3%	1	0.4%
110.135	PHPV/ PTVL	3	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	18	0.7%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	8	0.3%	1	0.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	184	7.4%	1	0.4%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	1	0.0%	0	0.0%

OCULAR DISORDERS REPORT
AMERICAN ESKIMO DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,497 #	 %	Year Examined: 2018-2022 Total # Dogs: 244 #	 %
OPTIC NERVE				
130.110 MICROPAPILLA	2	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	3	0.1%	0	0.0%
FUNDUS				
130.150 OPTIC DISC COLOBOMA	0	0.0%	1	0.4%
OTHER				
900.000 OTHER, UNSPECIFIED	8	0.3%	0	0.0%
900.100 OTHER, NOT INHERITED	86	3.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	27	1.1%	10	4.1%
NORMAL				
.000 NORMAL GLOBE	1,998	80.0%	198	81.1%

AMERICAN FOXHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN FOXHOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
AMERICAN FOXHOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	11		0	
	Diagnostic Name	**#**	**%**	**#**	**%**
EYELIDS					
25.110	DISTICHIASIS	2	18.2%	0	
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	6	54.5%	0	
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	4	36.4%	0	
OTHER					
900.000	OTHER, UNSPECIFIED	1	9.1%	0	
NORMAL					
.000	NORMAL GLOBE	6	54.5%	0	

AMERICAN HAIRLESS TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1,2	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

1. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sc*i. 2010 Sep;51:4716-4721. PMID: 20375329

2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011 Nov;14:378-384. PMID: 22050825

OCULAR DISORDERS REPORT
AMERICAN HAIRLESS TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	52		103	
	Diagnostic Name	**#**	**%**	**#**	**%**
EYELIDS					
25.110	DISTICHIASIS	0	0.0%	1	1.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	0	0.0%	1	1.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	3.8%	1	1.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	1.9%	4	3.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	1.9%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	1.9%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	1.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	2	1.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	1	1.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	1.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	1.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	1.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	1.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***2***	***3.8%***	***8***	***7.8%***
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	1.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	1.9%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	1	1.9%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	1.9%	1	1.0%
NORMAL					
.000	NORMAL GLOBE	46	88.5%	93	90.3%

AMERICAN HUSKY

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN HUSKY breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
AMERICAN HUSKY

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	1		0	
Diagnostic Name	**#**	**%**	**#**	**%**
NORMAL				
.000 NORMAL GLOBE	1	100.0%	0	

AMERICAN LEOPARD HOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN LEOPARD HOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
AMERICAN LEOPARD HOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	0		3	
Diagnostic Name		**#**	**%**	**#**	**%**
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0		1	33.3%
NORMAL					
.000	NORMAL GLOBE	0		2	66.7%

AMERICAN PIT BULL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- cone-rod dystrophy 2 (*crd2*)	Autosomal recessive	1	NO	Mutation in the *IQCB1* gene

Description and Comments

A. Retinal atrophy - cone-rod dystrophy 2 (*crd2*)

A cone rod dystrophy characterized by initial loss of cones (day vision) followed by degeneration of the rods (night vision). Evidence of vision loss is evident at an early age with severe retinal degeneration and complete blindness by a year of age. The disease is a severe early onset retinal blindness more appropriately considered a form of Leber congenital amaurosis (LCA). The condition is inherited as an autosomal recessive trait and caused by a mutation in *IQCB1.* A DNA test is available.

References

1. Goldstein O, Mezey JG, Schweitzer P, et al. IQCB1 and PDE6B mutations cause similar early onset retinal degenerations in two closely related terrier dog breeds. *Invest Ophthalmol*. 2013;54:7005-7019. PMID: 24045995

OCULAR DISORDERS REPORT
AMERICAN PIT BULL TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	204		43	
	Diagnostic Name	**#**	**%**	**#**	**%**
EYELIDS					
25.110	DISTICHIASIS	7	3.4%	1	2.3%
CORNEA					
70.700	CORNEAL DYSTROPHY	1	0.5%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.5%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	5	2.5%	2	4.7%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	1.0%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	1.0%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.5%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	7	3.4%	0	0.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	2	1.0%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	2	1.0%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.5%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.5%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.5%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.5%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	2.3%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.5%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***8***	***3.9%***	***0***	***0.0%***
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	2	1.0%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.5%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2	1.0%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	1	0.5%	0	0.0%
900.100	OTHER, NOT INHERITED	10	4.9%	1	2.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.5%	3	7.0%
NORMAL					
.000	NORMAL GLOBE	173	84.8%	35	81.4%

AMERICAN STAFFORDSHIRE TERRIER*

Please note that since 1972 the AKC considers the Staffordshire Bull Terrier a different breed from the American Staffordshire Terrier. Since the latter breed evolved from the former, it is possible that the same genetic diseases exist in both.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1, 2, 3	NO	
D.	Retinal atrophy				
D.	- rod cone dysplasia 1b (*rcd1b)*	Autosomal recessive	4	NO	Mutation in the *PDE6B* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make strong recommendations with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In this breed, cataracts usually develop by one year of age. There is initial opacification of the suture lines progressing to nuclear and cortical cataract formation; complete cataracts and blindness develop by three years of age. A simple autosomal recessive mode of inheritance has been proposed; however, the genetics have not been defined and additional studies will be required.

D. Retinal Atrophy - Rod-cone dysplasia 1b (rcd1b) [previously considered cone-rod

dystrophy 1(*crd1*)]

The disease was previously considered a cone-rod dystrophy (crd1) based on incorrect phenotype ascertainment using ERG (Aguirre, personal communication, 2016). The term crd1 should no longer be used to refer to the disease in this breed. The disease is more appropriately classified as rod-cone dysplasia 1b (rcd1b). In affected dogs there is evidence of vision loss at an early age with severe retinal degeneration and complete blindness by early adulthood, and ophthalmoscopic evidence of advanced retinal degeneration by 1 year of age. The disease is caused by a mutation in the *PDE6B* gene, with clinical abnormalities similar to what is found in rcd1-affected Irish Setters, and rcd1a affected Sloughis and Spanish Water Dogs. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract*. 1978;19:109-120. PMID: 642468 **reference derived from non-USA dog population**

3. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract*. 1985;26:305-316. **reference derived from non-USA dog population**

4. Goldstein O, Mezey JG, Schweitzer P, et al. IQCB1 and PDE6B mutations cause similar early onset retinal degenerations in two closely related terrier dog breeds. *Invest Ophthalmol*. 2013;54:7005-7019. PMID: 24045995

OCULAR DISORDERS REPORT
AMERICAN STAFFORDSHIRE TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	774		109	
	Diagnostic Name	#	%	#	%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	2	0.3%	0	0.0%
25.110	DISTICHIASIS	35	4.5%	3	2.8%
CORNEA					
70.210	PANNUS	1	0.1%	0	0.0%
70.220	PIGMENTARY KERATITIS	2	0.3%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	0	0.0%	1	0.9%
93.120	IRIS CYST	1	0.1%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.1%	1	0.9%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	31	4.0%	4	3.7%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.3%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	1	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	30	3.9%	4	3.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.1%	1	0.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.3%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.3%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.4%	2	1.8%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	2	1.8%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	4	0.5%	1	0.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	3	0.4%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	4	0.5%	1	0.9%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.9%
100.328	Y-SUTURE TIP OPACITIES	2	0.3%	2	1.8%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.3%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***23***	***3.0%***	***8***	***7.3%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.3%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	2	0.3%	1	0.9%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	8	1.0%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.3%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.4%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	8	1.0%	0	0.0%
900.100	OTHER, NOT INHERITED	30	3.9%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	11	1.4%	4	3.7%
NORMAL					
.000	NORMAL GLOBE	659	85.1%	91	83.5%

AMERICAN WATER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
AMERICAN WATER SPANIEL

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,118		126	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	2	0.2%	0	0.0%
10.000	GLAUCOMA	3	0.3%	0	0.0%
EYELIDS					
20.160	MACROPALPEBRAL FISSURE	2	0.2%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	7	0.6%	1	0.8%
22.000	ECTROPION, UNSPECIFIED	2	0.2%	0	0.0%
25.110	DISTICHIASIS	362	32.4%	55	43.7%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.8%
CORNEA					
70.220	PIGMENTARY KERATITIS	1	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	5	0.4%	3	2.4%
UVEA					
93.120	IRIS CYST	1	0.1%	0	0.0%
93.150	IRIS COLOBOMA	2	0.2%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	12	1.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.2%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	6	0.5%	4	3.2%
LENS					
100.200	CATARACT, UNSPECIFIED	5	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	40	3.6%	9	7.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	5	0.4%	1	0.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	7	0.6%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.2%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	10	0.9%	5	4.0%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.2%	1	0.8%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.3%	6	4.8%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	7	0.6%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	12	1.1%	6	4.8%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	7	0.6%	1	0.8%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.2%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.8%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.8%
100.328	Y-SUTURE TIP OPACITIES	5	0.4%	4	3.2%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	0	0.0%	1	0.8%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***66***	***5.9%***	***22***	***17.5%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.2%	0	0.0%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	2	1.6%
110.320	VITREOUS DEGENERATION SYNERESIS	1	0.1%	2	1.6%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	8	0.7%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	0.4%	0	0.0%
120.960	RETINOPATHY	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
AMERICAN WATER SPANIEL

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,118		126	
Diagnostic Name		**#**	**%**	**#**	**%**
OPTIC NERVE					
130.110	MICROPAPILLA	2	0.2%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	5	0.4%	0	0.0%
900.100	OTHER, NOT INHERITED	18	1.6%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	0.4%	5	4.0%
NORMAL					
.000	NORMAL GLOBE	688	61.5%	55	43.7%

ANATOLIAN SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ANATOLIAN SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
ANATOLIAN SHEPHERD

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	46		34	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	2.2%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	0	0.0%	1	2.9%
CORNEA					
70.700	CORNEAL DYSTROPHY	0	0.0%	2	5.9%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	2.2%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	6.5%	3	8.8%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	1	2.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	2	5.9%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	2.2%	2	5.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	1	2.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	2.9%
100.328	Y-SUTURE TIP OPACITIES	1	2.2%	1	2.9%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***1***	***2.2%***	***7***	***20.6%***
FUNDUS					
130.110	MICROPAPILLA	0	0.0%	1	2.9%
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.3%	1	2.9%
NORMAL					
.000	NORMAL GLOBE	39	84.8%	26	76.5%

ARMENIAN GAMPR

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ARMENIAN GAMPR breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
ARMENIAN GAMPR

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	4		0	
Diagnostic Name	**#**	**%**	**#**	**%**
NORMAL				
.000 NORMAL GLOBE	4	100.0%	0	

AUSTRALIAN CATTLE DOG

(Queensland Heeler or Blue Heeler)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	2	NO	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Y-suture tip opacity	Not defined	1	Breeder option	
F.	Lens luxation	Autosomal recessive	3, 4	NO	Mutation in the *ADAMTS17* gene
G.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- *prcd*	Autosomal recessive	5	NO	Mutation in the *prcd* gene
	- rod-cone dysplasia type 4 (*rcd4*)	Autosomal recessive	1	NO	Mutation in the *C2orf71* gene
H.	Retinopathy	Not defined	1	Breeder option	

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy).

B. Persistent pupillary membranes (PPMs)

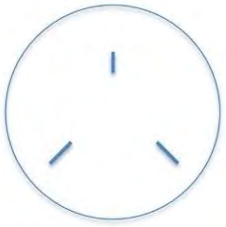
Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Y-suture tip opacity

These are prominent (or "highlighted" or "more dense") distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a "peace sign" as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



E. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

F. Retinal atrophy

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Studies have shown that one form of PRA in the Australian Cattle Dog is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. However, in the Australian Cattle Dog the phenotype can be very variable in the age of onset. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

Other forms of retinal degeneration that are not *prcd* are recognized in the breed. The currently available genetic test will not detect these other forms of PRA.

- rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified also in the Australian Cattle Dog breed. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA

test is available. The test is accurate only for this mutation and is of no value in identifying other forms of PRA.

H. Retinopathy

Any non-inflammatory condition of the retina. These conditions can usually be detected by ophthalmoscopic examination, but an electroretinogram (ERG) may be required in some instances (e.g. canine multifocal retinopathy).

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111. PMID: 14982589

3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384. PMID: 22050825

4. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010;51:4716-4721. PMID: 20375329

5. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

OCULAR DISORDERS REPORT
AUSTRALIAN CATTLE DOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	4,871		532	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.0%	1	0.2%
EYELIDS					
22.000	ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110	DISTICHIASIS	16	0.3%	1	0.2%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	1	0.2%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	2	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	2	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	26	0.5%	4	0.8%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	4	0.1%	0	0.0%
UVEA					
93.120	IRIS CYST	12	0.2%	2	0.4%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	46	0.9%	6	1.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.0%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	6	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	3	0.6%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.0%	0	0.0%
95.120	CILIARY BODY CYST	2	0.0%	3	0.6%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	3	0.1%	0	0.0%
97.120	COLOBOMA	1	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.4%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.2%
LENS					
100.200	CATARACT, UNSPECIFIED	35	0.7%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	298	6.1%	27	5.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	53	1.1%	13	2.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	40	0.8%	5	0.9%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	19	0.4%	3	0.6%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	7	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	32	0.7%	9	1.7%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.1%	2	0.4%
100.307	PUNCTATE CATARACT, CAPSULAR	5	0.1%	2	0.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	48	1.0%	14	2.6%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	71	1.5%	4	0.8%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	54	1.1%	6	1.1%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.1%	4	0.8%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	19	0.4%	2	0.4%
100.316	INCIPIENT CATARACT, NUCLEUS	6	0.1%	2	0.4%
100.317	INCIPIENT CATARACT, CAPSULAR	5	0.1%	3	0.6%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	3	0.6%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.0%	1	0.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	2	0.4%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	3	0.1%	1	0.2%

OCULAR DISORDERS REPORT
AUSTRALIAN CATTLE DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4,871 #	 %	Year Examined: 2018-2022 Total # Dogs: 532 #	 %
LENS Continued				
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES	12	0.2%	19	3.6%
100.330 GENERALIZED/ COMPLETE CATARACT	23	0.5%	1	0.2%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***432***	***8.9%***	***79***	***14.8%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	8	0.2%	0	0.0%
110.135 PHPV/ PTVL	1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	12	0.2%	2	0.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	38	0.8%	1	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	13	0.3%	2	0.4%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	1	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	252	5.2%	6	1.1%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	2	0.4%
120.960 RETINOPATHY	2	0.0%	6	1.1%
120.970 CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.2%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	2	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	20	0.4%	0	0.0%
900.100 OTHER, NOT INHERITED	126	2.6%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	52	1.1%	35	6.6%
NORMAL				
.000 NORMAL GLOBE	3,999	82.1%	412	77.4%

AUSTRALIAN KELPIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	2-4	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Kucharczyk, N., et al. (2019). "Collie Eye Anomaly in Australian Kelpie dogs in Poland." BMC Vet Res 15(1): 392. PMID: 31684941. **reference derived from non-USA dog population**

3. Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. PMID: 29708978

4. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B,

Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
AUSTRALIAN KELPIE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 233 #	 %	Year Examined: 2018-2022 Total # Dogs: 18 #	 %
CORNEA				
70.700 CORNEAL DYSTROPHY	1	0.4%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	5.6%
93.810 UVEAL MELANOMA	3	1.3%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.4%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	5	2.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	29	12.4%	4	22.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	8	3.4%	1	5.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	8	3.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.4%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.4%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.4%	3	16.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	9	3.9%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	7	3.0%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.9%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.4%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.4%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***44***	***18.9%***	***4***	***22.2%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.9%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	1	0.4%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	5	2.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	11	4.7%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	7	3.0%	0	0.0%
900.100 OTHER, NOT INHERITED	8	3.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	0.9%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	177	76.0%	13	72.2%

AUSTRALIAN KOOLIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/coloboma	Autosomal recessive	1	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
AUSTRALIAN KOOLIE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4 #	 %	2018-2022 9 #	 %
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	2	22.2%
NORMAL				
.000 NORMAL GLOBE	4	100.0%	7	77.8%

AUSTRALIAN LABRADOODLE

(Labradoodle, Australian Cobber Dog)

*Due to the breed's ancestry, most of the references cited are for the Labrador Retriever or Standard Poodle. The examiner may also find the Labrador Retriever and Standard Poodle pages as a helpful resource for other conditions that may occur but are not yet reported in the Australian Labradoodle.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Imperforate lower nasolacrimal punctum	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
E.	Cataract	Not defined	1	NO	
F.	Y- suture tip opacity	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- *prcd*	Autosomal recessive	2, 3	NO	Mutation of the *prcd* gene
H.	Achromatopsia Type 2 (day blindness/retinal degeneration)	Autosomal recessive	1	NO	Mutation has not been published
I.	Retinal dysplasia				
	- folds	Presumed autosomal recessive	1	NO (Breeder option with Normal DNA test)	Mutation of the *COL9A3* gene
	- geographic (without skeletal defects	Not defined	1, 4, 5	NO	
	- detached/generalized (without skeletal defects)	autosomal recessive	6, 7	NO	
J.	Retinal dysplasia - folds/detached (with skeletal defects)	Autosomal recessive	8-15	NO	Mutation of the *COL9A3* gene
K.	Limbal melanoma	Not defined	16	NO	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Imperforate lower nasolacrimal punctum

Development anomaly resulting in an imperforate opening of the lacrimal puncta. An imperforate lower punctum may result in epiphora, an overflow of tears onto the face.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

In Labrador Retrievers in Europe, one form of corneal dystrophy, known as macular dystrophy, has been shown to be caused by accumulations of glycosaminoglycans in the corneal stroma. This form of corneal dystrophy is caused by a mutation in the CHST6 gene, and therefore it is recommended that dogs with this disease not be bred. This has not yet been reported in Australian Labradoodles but could potentially occur due to the breed's history.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

E. Cataract

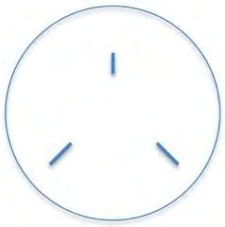
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The most frequently reported cataracts in the Australian Labradoodle are bilateral or unilateral, focal, posterior polar (posterior cortical)/subcapsular cataracts, which usually present between 1-3 years of age. These are generally stationary or very slowly progressive and generally do not interfere with vision. It has been suggested that these cataracts are inherited as dominant with incomplete penetrance, but definitive breeding studies are still required to verify this hypothesis.

A second type of cataract is a progressive cortical cataract which may involve the entire lens. It is not clear whether this is a distinct entity, or an aberrant form of the posterior polar cataract.

F. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

G. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Unpublished data from Optigen Labs has shown that the principal form of PRA in the Australian Labradoodle is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Labrador Retrievers, Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

H. Achromatopsia Type 2 (ACHM – Type 2)

An autosomal recessive disorder of Standard Poodles and ‘doodles’ (where the mix-bred dogs are backcrossed to Standard Poodles that carry the genetic defect); the disease also has been referred to as day blindness/retinal degeneration. The salient clinical finding is profound visual difficulty in bright light (day blindness) with subjective normal night vision. In the early stages of the disease, fundus examination is normal with some dogs showing focal hyperreflectivity of the cone-rich fovea like region of the retina; the photopic ERG is not recordable. In some older dogs, there is progression resulting in poor/absent vision under both dim and bright light conditions, markedly abnormal or non-recordable ERG, and a fundus appearance indicative of late-stage retinal degeneration and indistinguishable from progressive retinal atrophy.

I. Retinal dysplasia

- folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. In the Labrador Retriever, the presence of retinal folds may be seen in the heterozygous state of oculoskeletal dysplasia described below, thus the recommendation against breeding.

The breeding advice for Labrador Retrievers and Samoyeds diagnosed with "retinal dysplasia - folds" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *COL9A3* mutation.

- geographic, detached without skeletal defects

Retinal dysplasia - geographic: An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

Retinal dysplasia - detached: Abnormal development of the retina occurring in late gestation resulting in retinal detachment and blindness by 8 weeks of age. This disease was described in Sweden in the 1970s and appears to have been eliminated.

J. Retinal dysplasia – folds, geographic or detachment with skeletal defects

This condition is also known as oculo-skeletal dysplasia (OSD) or dwarfism with retinal dysplasia type 1 (DRD1) in the Labrador Retriever. A similar condition, DRD2, occurs in the Samoyed. The condition is autosomal recessive and homozygous affected dogs have shortened forelimbs (“downhill” conformation) with valgus deformity. They have severe ocular defects including cataract, retinal folds/multifocal retinal dysplasia, vitreal degeneration and retinal detachment. The ocular abnormalities result in blindness in most dogs. Heterozygous dogs can have either a normal ocular exam or have multiple retinal folds, vitreal membranes, or vitreal degeneration. It is important to note that generally the retinal folds present in heterozygous dogs tend to cluster around the major superior blood vessels of the central tapetal region. The condition is caused by a 1 base pair insertion of *COL9A3.* A DNA test is available.

K. Limbal melanoma

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predisposition has been noted in the German Shepherd, Labrador and Golden Retriever.

References

1. ACVO Genetics Committee and/or Data from OFA All Breeds Report.

2. Personal communication on data from Optigen with Sue Pearce-Kelling based on unpublished data

3. Zangerl B, Goldstein O, Philp AR, Lindauer SJ, Pearce-Kelling SE, Mullins RF, Graphodatsky AS, Ripoll D, Felix JS, Stone EM, Acland GM, Aguirre GD. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. Genomics. 2006 Nov;88(5):551-63. doi: 10.1016/j.ygeno.2006.07.007. Epub 2006 Aug 30. PMID: 16938425; PMCID: PMC3989879.

4. Iwabe, S., et al. (2020). "Focal/multifocal and geographic retinal dysplasia in the dog-In vivo retinal microanatomy analyses." Vet Ophthalmol 23(2): 292-304. PMID: 31746146

5. Osinchuk SC, Sandmeyer LS, Grahn BH. In vivo imaging comparison of unilateral circular retinal plaques in retriever dogs to dysplasia and detachment in the English Springer Spaniel. Vet Ophthalmol. 2020 Nov;23(6):957-963. doi: 10.1111/vop.12828. Epub 2020 Sep 29. PMID: 32990375.

6. Barnett KC, al. e. Hereditary retinal dysplasia in the Labrador Retriever in England and Sweden. *J Small Anim Pract*. 1970;10:755-759.

7. Kock E. Retinal dysplasia. Thesis, Stockholm, 1974.

8. Carrig CB, MacMillan A, Brundage S, et al. Retinal dysplasia associated with skeletal abnormalities in Labrador Retrievers. *J Am Vet Med Assoc*. 1977;170:49-57. PMID: 830631

9. Carrig CB, Schmidt GM, Tvedten HML. Growth of the radius and ulna in Labrador Retriver dogs with ocular and skeletal dysplasia. *Vet Radiol*. 1990;31:165-168.

10. Carrig CB, Sponenberg DP, Schmidt GM, et al. Inheritance of associated ocular and skeletal dysplasia in Labrador Retrievers. *J Am Vet Med Assoc*. 1988;193:1269-1272. PMID: 3204050

11. Nelson D, MacMillan A. Multifocal retinal dysplasia in the field trial Labrador Retriever. *J Am Anim Hosp Assoc*. 1983;19:388-392.

12. Blair NP, Dodge JT, Schmidt GM. Rhegmatogenous retinal detachment in Labrador Retrievers. II. Proliferative vitreoretinopathy. *Arch Ophthalmol*. 1985;103:848-854. PMID: 4004628

13. Blair NP, Dodge JT, Schmidt GM. Rhegmatogenous retinal detachment in Labrador Retrievers. I. Development of retinal tears and detachment. *Arch Ophthalmol*. 1985;103:842-847. PMID: 4004627

14. Gionfriddo JR, Betts DM, Niyo Y. Retinal and skeletal dysplasia in a field trial Labrador puppy. *Canine Pract*. 1992;17:25-29.

15. Goldstein O, Guyon R, Kukekova A, et al. COL9A2 and COL9A3 mutations in canine autosomal recessive oculoskeletal dysplasia. *Mamm Genome*. 2010;21:398-408. PMID: 20686772

16. Donaldson D, Sansom J, Scase T, et al. Canine limbal melanoma: 30 cases (1992-2004). Part 1. Signalment, clinical and histological features and pedigree analysis. *Vet Ophthalmol*. 2006;9:115-119. PMID: 16497236

OCULAR DISORDERS REPORT
AUSTRALIAN LABRADOODLE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	14,348		20,803	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	6	0.0%	3	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	2	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	5	0.0%	9	0.0%
22.000	ECTROPION, UNSPECIFIED	2	0.0%	0	0.0%
25.110	DISTICHIASIS	272	1.9%	423	2.0%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	29	0.1%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	31	0.2%	21	0.1%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	2	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	6	0.0%	4	0.0%
CORNEA					
70.210	PANNUS	2	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	343	2.4%	236	1.1%
UVEA					
93.110	IRIS HYPOPLASIA	5	0.0%	6	0.0%
93.120	IRIS CYST	0	0.0%	1	0.0%
93.150	IRIS COLOBOMA	2	0.0%	1	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1,044	7.3%	1,510	7.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	41	0.3%	17	0.1%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.0%	5	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	365	2.5%	920	4.4%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	10	0.1%	2	0.0%
93.810	UVEAL MELANOMA	5	0.0%	1	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	5	0.0%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	2	0.0%	1	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	59	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	5	0.0%
120.960	RETINOPATHY	0	0.0%	1	0.0%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	3	0.0%
130.110	MICROPAPILLA	0	0.0%	11	0.1%
130.150	OPTIC DISC COLOBOMA	0	0.0%	9	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	331	2.3%	536	2.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	111	0.8%	137	0.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	50	0.3%	65	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	15	0.1%	17	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	17	0.1%	21	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	139	1.0%	95	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	36	0.3%	31	0.1%
100.307	PUNCTATE CATARACT, CAPSULAR	148	1.0%	186	0.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	34	0.2%	37	0.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	33	0.2%	42	0.2%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	17	0.1%	19	0.1%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	6	0.0%	5	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	23	0.2%	38	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	24	0.2%	33	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	29	0.2%	70	0.3%

OCULAR DISORDERS REPORT
AUSTRALIAN LABRADOODLE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 14,348 #	 %	Year Examined: 2018-2022 Total # Dogs: 20,803 #	 %
LENS Continued				
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	10	0.1%	5	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	6	0.0%	6	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	4	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	3	0.0%	2	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	14	0.1%	14	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	2	0.0%	1	0.0%
100.328 Y-SUTURE TIP OPACITIES	97	0.7%	213	1.0%
100.330 GENERALIZED/ COMPLETE CATARACT	23	0.2%	3	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	2	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	0	0.0%	10	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***743***	***5.2%***	***833***	***4.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	51	0.4%	98	0.5%
110.135 PHPV/ PTVL	6	0.0%	13	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.0%	4	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	26	0.2%	11	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	120	0.8%	57	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	8	0.1%	2	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	0	0.0%
120.960 RETINOPATHY	14	0.1%	3	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	44	0.3%	23	0.1%
130.120 OPTIC NERVE HYPOPLASIA	10	0.1%	2	0.0%
130.150 OPTIC DISC COLOBOMA	4	0.0%	6	0.0%
OTHER				
900.100 OTHER, NOT INHERITED	24	0.2%	7	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	477	3.3%	720	3.5%
NORMAL				
.000 NORMAL GLOBE	9,370	65.3%	16,303	78.4%

AUSTRALIAN SHEPHERD

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris coloboma.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia with multiple ocular defects	Presumed autosomal recessive with incomplete penetrance	2-6	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Iris coloboma	Not defined	1	NO	
E.	Iris hypoplasia	Not defined	1	Breeder option	
F.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
G.	Cataract				
	- generalized	Not defined	1	NO	
	- *HSF4*	Autosomal dominant (possibly incomplete penetrance)	7, 8	NO	Mutation in the *HSF4* gene
H.	Y-suture tip opacity	Not defined	1	Breeder option	
I.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
J.	Persistent hyaloid artery remnant	Not defined	1, 13	Breeder option	
K.	Retinal atrophy				
	- generalized	Not defined	1		
	- (*prcd)*	Autosomal recessive	14	NO	Mutation in the *prcd* gene

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
L.	Multifocal retinopathy - *cmr1*	Autosomal recessive	9, 15	NO (Breeder option with normal DNA test for CMR)	Mutation in the *BEST1* gene
M.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
N.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	10-14	NO	Mutation in the *NHEJ1* gene
O.	Coloboma/staphyloma without microphthalmia	Not defined	1	NO	
P.	Micropapilla	Not defined	1	Breeder option	

Description and Comments

A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye with associated defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (dysplasia). In the Australian Shepherd, microphthalmia has long been suspected to be associated with merle coat coloration but a definitive genetic relationship has not been established. The eyes of affected homozygous merle (usually white) dogs have extreme forms of this entity and are usually blind at birth. Affected heterozygous merle-coated dogs demonstrate less severe manifestations.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Iris coloboma

A congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o’clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the OFA form.

E. Iris hypoplasia

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the OFA form.

F. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

- generalized

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

- HSF4

In the Australian Shepherd, a mutation in *HSF4* (heat shock transcription factor 4), the HSF4-2 mutation, has been shown to increase the likelihood of cataract formation. The mutation is inherited in a co-dominant manner. Dogs with one copy of the mutation develop bilateral posterior cataracts and homozygotes develop a nuclear cataract that typically progresses to a mature cataract. A DNA test is available for this mutation. Other genetic factors can contribute to cataract formation in this breed and will not be detected by this test.

H. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.

These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

I. Vitreous degeneration - syneresis

A liquefaction of the vitreous gel which may predispose to retinal detachment.

J. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

K. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- *prcd*

Unpublished data from genetics laboratories has shown that the principal form of PRA in the Australian Shepherd is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically at 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

L. Multifocal retinopathy – *cmr1*

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression in the initial serous lesions after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs initially exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas, though the retina will continue to degenerate over time thus eventually causing vision impairment.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, Mastiff, Australian Shepherd and other breeds.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

M. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

N. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

O. Coloboma/staphyloma (unassociated with microphthalmia)

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin. Scleral ectasia is defined as a congenital thinning and secondary distention of the sclera; when lined by uveal tissue it is called a staphyloma. These may be anteriorly located, apparent as a bulge beneath the upper eyelid or posteriorly located, requiring visualization with an ophthalmoscope. These conditions may or may not be genetically related to the same anomalies seen associated with microphthalmia (entity "A" above).

P. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment.

Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gelatt KN, McGill LD. Clinical characteristics of microphthalmia with colobomas of the Australian Shepherd Dog. *J Am Vet Med Assoc*. 1973;162:393-396. PMID: 4691375

3. Gelatt KN, Veith LA. Hereditary multiple ocular anomalies in Australian shepherd dogs. *Vet Med Small Anim Clin*. 1970;65:39-42. PMID: 4984250

4. Cook CS, Burling K, Nelson EJ. Embryogenesis of posterior segment colobomas in the Australian shepherd dog. *Prog in Vet Comp Ophthalmol*. 1991;1:163-170.

5. Bertram T, Coiqnoul F, Cheville N. Ocular dysgenesis in Australian shepherd dogs. *J Am Anim Hosp Assoc*. 1984;20:177-182.

6. Gelatt KN, Powell NG, Huston K. Inheritance of microphthalmia with coloboma in the Australian shepherd dog. *Am J Vet Res*. 1981;42:1686-1690. PMID: 7325429

7. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol*. 2006;9:369-378. PMID: 16939467

8. Mellersh CS, McLaughlin B, Ahonen S, et al. Mutation in HSF4 is associated with hereditary cataract in the Australian Shepherd. *Vet Ophthalmol*. 2009;12:372-378. PMID: 19883468

9. Hoffman I, Guziewicz KE, Zangler B, et al. Canine multifocal retinopathy in the Australian Shepherd: a case report. *Vet Ophthalmol*. 2012;15:134-138. PMID: 22432598

10. Rubin LF, Nelson EJ, Sharp CA. Collie eye anomaly in Australian shepherd dogs. *Prog in Vet Comp Ophthalmol*. 1991;1:105-108.

11. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics*. 2003;82:86-95. PMID: 12809679

12. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome research*. 2007;17:1562-1571. PMID: 17916641

13. Munyard KA, Sherry CR, Sherry L. A retrospective evaluation of congenital ocular defects in Australian Shepherd dogs in Australia. *Vet Ophthalmol*. 2007;10:19-22. PMID: 17204124 **reference derived from non-USA dog population**

14. Personal communication on data from Optigen with Sue Pearce-Kelling.

15. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

OCULAR DISORDERS REPORT
AUSTRALIAN SHEPHERD

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	106,396		23,129	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	96	0.1%	16	0.1%
10.000	GLAUCOMA	8	0.0%	0	0.0%
EYELIDS					
20.110	EYELID DERMOID	1	0.0%	0	0.0%
20.140	ECTOPIC CILIA	5	0.0%	1	0.0%
20.160	MACROPALPEBRAL FISSURE	4	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	16	0.0%	1	0.0%
22.000	ECTROPION, UNSPECIFIED	6	0.0%	0	0.0%
25.110	DISTICHIASIS	1,704	1.6%	346	1.5%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	5	0.0%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	8	0.0%	4	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	0	0.0%	1	0.0%
51.100	THIRD EYELID CARTILAGE ANOMALY	4	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.0%	1	0.0%
CORNEA					
70.210	PANNUS	9	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	1	0.0%	1	0.0%
70.700	CORNEAL DYSTROPHY	533	0.5%	123	0.5%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	15	0.0%	1	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	266	0.3%	177	0.8%
93.120	IRIS CYST	39	0.0%	4	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150	IRIS COLOBOMA	1,522	1.4%	215	0.9%
93.170	ANTERIOR CHAMBER CYST	4	0.0%	0	0.0%
93.180	IIRIS SPHINCTER DYSPLASIA	17	0.0%	6	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	5,309	5.0%	1,651	7.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	96	0.1%	22	0.1%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	45	0.0%	7	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	92	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	35	0.0%	28	0.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	22	0.0%	8	0.0%
93.810	UVEAL MELANOMA	8	0.0%	2	0.0%
95.120	CILIARY BODY CYST	1	0.0%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	25	0.0%	6	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	166	0.2%	33	0.1%
97.120	COLOBOMA	96	0.1%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	52	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	0	0.0%	2	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	3	0.0%
120.960	RETINOPATHY	0	0.0%	1	0.0%
130.110	MICROPAPILLA	0	0.0%	57	0.2%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	4	0.0%
130.150	OPTIC DISC COLOBOMA	0	0.0%	5	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	169	0.2%	0	0.0%

OCULAR DISORDERS REPORT
AUSTRALIAN SHEPHERD

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 106,396 #	 %	Year Examined: 2018-2022 Total # Dogs: 23,129 #	 %
LENS Continued					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2,503	2.4%	447	1.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	340	0.3%	107	0.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	372	0.3%	62	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	118	0.1%	35	0.2%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	42	0.0%	14	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	345	0.3%	118	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	260	0.2%	82	0.4%
100.307	PUNCTATE CATARACT, CAPSULAR	150	0.1%	91	0.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	342	0.3%	68	0.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	783	0.7%	74	0.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	206	0.2%	26	0.1%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	26	0.0%	2	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	167	0.2%	15	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	226	0.2%	34	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	124	0.1%	40	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	18	0.0%	9	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	29	0.0%	27	0.1%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	8	0.0%	3	0.0%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	3	0.0%	4	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	8	0.0%	10	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	3	0.0%	3	0.0%
100.328	Y-SUTURE TIP OPACITIES	103	0.1%	137	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	236	0.2%	6	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	18	0.0%	2	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***3,975***	***3.7%***	***832***	***3.6%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	562	0.5%	170	0.7%
110.135	PHPV/ PTVL	113	0.1%	16	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	47	0.0%	19	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	239	0.2%	43	0.2%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	1,041	1.0%	96	0.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	46	0.0%	3	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	10	0.0%	2	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	135	0.1%	3	0.0%
120.400	RETINAL HEMORRHAGE	13	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	61	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	14	0.0%	4	0.0%
120.960	RETINOPATHY	11	0.0%	7	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	243	0.2%	54	0.2%
130.120	OPTIC NERVE HYPOPLASIA	121	0.1%	13	0.1%
130.150	OPTIC DISC COLOBOMA	163	0.2%	15	0.1%
OTHER					
900.000	OTHER, UNSPECIFIED	545	0.5%	0	0.0%
900.100	OTHER, NOT INHERITED	1,279	1.2%	6	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	758	0.7%	440	1.9%
NORMAL					
.000	NORMAL GLOBE	92,687	87.1%	19,236	83.2%

AUSTRALIAN STUMPY TAIL CATTLE DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- (*prcd*)	Autosomal recessive	1	NO	Mutation in the *prcd* gene

Description and Comments

A. Retinal atrophy

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Studies have shown that the principal form of PRA in the Australian Stumpy Tail Cattle Dog is *prcd*, which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Australian Stumpy Tail Cattle Dog. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563. PMID: 16938425

OCULAR DISORDERS REPORT
AUSTRALIAN STUMPY TAIL CATTLE DOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	44		10	
	Diagnostic Name	#	%	#	%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.5%	0	0.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	2.3%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	2.3%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1	2.3%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	2	4.5%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	4.5%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	2.3%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***8***	***18.2%***	***0***	***0.0%***
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	1	2.3%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	2.3%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	6.8%	0	0.0%
OTHER					
900.100	OTHER, NOT INHERITED	1	2.3%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	2.3%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	38	86.4%	10	100.0%

AUSTRALIAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
B.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
AUSTRALIAN TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	938		198	
	Diagnostic Name	#	%	#	%
GLOBE					
10.000	GLAUCOMA	1	0.1%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	2	0.2%	0	0.0%
25.110	DISTICHIASIS	3	0.3%	0	0.0%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.5%
CORNEA					
70.220	PIGMENTARY KERATITIS	1	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	4	0.4%	1	0.5%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	44	4.7%	18	9.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.3%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	9	1.0%	12	6.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	1	0.5%
LENS					
100.200	CATARACT, UNSPECIFIED	2	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	34	3.6%	5	2.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	7	0.7%	2	1.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.3%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.2%	1	0.5%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.4%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.2%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	7	0.7%	2	1.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	6	0.6%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	5	0.5%	1	0.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.1%	1	0.5%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.2%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	3	1.5%
100.330	GENERALIZED/ COMPLETE CATARACT	8	0.9%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***53***	***5.7%***	***7***	***3.5%***
VITREOUS					
110.320	VITREOUS DEGENERATION SYNERESIS	3	0.3%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	3	0.3%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.3%	0	0.0%
120.400	RETINAL HEMORRHAGE	1	0.1%	0	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	1	0.1%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	4	0.4%	0	0.0%
900.100	OTHER, NOT INHERITED	8	0.9%	2	1.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	0.5%	10	5.1%

OCULAR DISORDERS REPORT
AUSTRALIAN TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 938 #	%	2018-2022 198 #	%
NORMAL				
.000 NORMAL GLOBE	817	87.1%	153	77.3%

AZAWAKH

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AZAWAKH breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
AZAWAKH

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 13 #	 %	2018-2022 8 #	 %
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	7.7%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	7.7%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***7.7%***	***0***	***0.0%***
OTHER				
900.000 OTHER, UNSPECIFIED	1	7.7%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	12	92.3%	8	100.0%

BARBET

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Y suture tip opacity	Not defined	1	Breeder option	
D.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- *prcd*	Autosomal recessive	2	NO	Mutation in the *prcd* gene

Description and Comments

A. Distichiasis

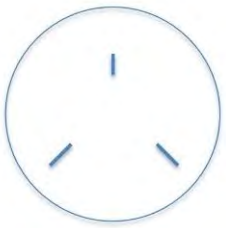
Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form

(3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

D. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Unpublished data from genetics laboratories has shown that the principal form of PRA in the Barbet is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically at 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Personal communication on data from Optigen with Sue Pearce-Kelling

OCULAR DISORDERS REPORT
BARBET

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 220 #	 %	2018-2022 251 #	 %
EYELIDS				
25.110 DISTICHIASIS	10	4.5%	15	6.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	0.5%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	0	0.0%	1	0.4%
93.120 IRIS CYST	1	0.5%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	0	0.0%	1	0.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	6	2.7%	3	1.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	8	3.6%	1	0.4%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.5%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	32	14.5%	9	3.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	6	2.7%	6	2.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.5%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	3	1.4%	1	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.5%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	4	1.8%	1	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS	4	1.8%	1	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	2	0.9%	2	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	4	1.8%	1	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.5%	2	0.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.5%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.5%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES	7	3.2%	8	3.2%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.5%	1	0.4%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***29***	***13.2%***	***18***	***7.2%***
VITREOUS				
110.320 VITREOUS DEGENERATION SYNERESIS	1	0.5%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	0.5%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.8%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.5%	0	0.0%
120.960 RETINOPATHY	2	0.9%	1	0.4%
OPTIC NERVE				
130.110 MICROPAPILLA	0	0.0%	2	0.8%
OTHER				
900.000 OTHER, UNSPECIFIED	2	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	2	0.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	9	4.1%	8	3.2%
NORMAL				
.000 NORMAL GLOBE	167	75.9%	206	82.1%

BASENJI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1, 2-5	Breeder option	
	- iris to cornea	Not defined	1	NO	
	- iris to lens	Not defined	1	NO	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
	- endothelial opacity/no strands	Not defined	1	NO	
C.	Cataract	Not defined	1	NO	
D.	Y suture tip opacity	Not defined	1	Breeder option	
E.	Retinal atrophy				
	- generalized	Not defined	1, 6	NO	
	- Bas_PRA1	Autosomal recessive	7	NO	Mutation in the S-antigen (*SAG)*
F.	Optic nerve coloboma	Not defined	2	NO	

Description and Comments

A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Basenji, this is a particularly significant problem with many cases reported where the strands bridge between the iris and the cornea resulting in localized corneal opacities which may cause vision impairment. This has also been associated with optic nerve coloboma (see “F” below).

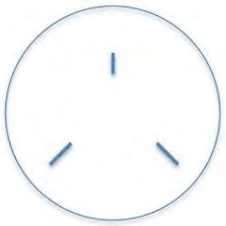
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

E. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

- Bas_PRA1

A specific mutation has been located in the S-antigen (*SAG)* gene that causes a late onset form of retinal degeneration in the Basenji. The condition is inherited in an autosomal recessive fashion. Initial thinning of the retina evidenced by irregular hypo and hyper-reflectivity of the tapetal fundus is typically noted at 5

years of age with retinal vascular attenuation noted by 6-7 years of age. Clinically the disease closely resembles *prcd*-PRA. The retinal degeneration progresses gradually and ultimately results in complete vision loss. This mutation is responsible for the majority, but not all cases of PRA within the Basenji breed.

F. Optic nerve coloboma

A congenital cavity in the optic nerve which, if large, may cause blindness or vision impairment.

In the Basenji, this condition has been associated with persistent pupillary membranes (see above).

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Barnett KC and Knight CG. Persistent pupillary membrane and associated defects in the Basenji. *Vet Rec*. 1969 Aug 30;85:242-248. PMID: 4980462 **reference derived from non-USA dog population**

3. Roberts SR and Bistner SI. Persistent pupillary membrane in Basenji dogs. *J Am Vet Med Assoc*. 1968 Sep 1;153:533-542. PMID: 5691151

4. Mason TA. Persistent pupillary membrane in the Basenji. *Aust Vet J*. 1976 Aug;52:343-344. PMID: 985254 **reference derived from non-USA dog population**

5. Bistner SI, Rubin LF and Roberts SR. A review of persistent pupillary membranes in the Basenji dog. *J Am Anim Hosp Assoc*. 1971;7:143.

6. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex. *American Journal of Veterinary Research*. 1974;35:571-574.

7. Goldstein O, Jordan JA, Aguirre GD, et al. A non-stop S-antigen gene mutation is associated with late onset hereditary retinal degeneration in dogs. *Mol Vis*. 2013;19:1871-1884. PMID: 24019744

OCULAR DISORDERS REPORT
BASENJI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 11,124 #	 %	2018-2022 1,569 #	 %
GLOBE				
.110 MICROPHTHALMIA	8	0.1%	1	0.1%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	6	0.1%	2	0.1%
22.000 ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110 DISTICHIASIS	68	0.6%	14	0.9%
CORNEA				
70.210 PANNUS	2	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	335	3.0%	33	2.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	251	2.3%	10	0.6%
UVEA				
90.250 PIGMENTARY UVEITIS	1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA	0	0.0%	2	0.1%
93.120 IRIS CYST	2	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	18	0.2%	0	0.0%
93.150 IRIS COLOBOMA	9	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	0	0.0%	6	0.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	5,719	51.4%	978	62.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	463	4.2%	51	3.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1,157	10.4%	130	8.3%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	42	0.4%	7	0.4%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	20	0.2%	37	2.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	222	2.0%	170	10.8%
93.810 UVEAL MELANOMA	0	0.0%	1	0.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
97.120 COLOBOMA	13	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.1%
130.150 OPTIC DISC COLOBOMA	0	0.0%	6	0.4%
LENS				
100.200 CATARACT, UNSPECIFIED	47	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	488	4.4%	40	2.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	53	0.5%	7	0.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	22	0.2%	9	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	11	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	5	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	93	0.8%	26	1.7%
100.306 PUNCTATE CATARACT, NUCLEUS	25	0.2%	10	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR	79	0.7%	20	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	33	0.3%	2	0.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	28	0.3%	10	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	19	0.2%	2	0.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	36	0.3%	3	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS	22	0.2%	4	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR	24	0.2%	6	0.4%

OCULAR DISORDERS REPORT
BASENJI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 11,124 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,569 #	 %
LENS Continued				
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	19	0.2%	38	2.4%
100.330 GENERALIZED/ COMPLETE CATARACT	22	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***523***	***4.7%***	***99***	***6.3%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	10	0.1%	6	0.4%
110.135 PHPV/ PTVL	8	0.1%	3	0.2%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	6	0.1%	2	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	25	0.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	20	0.2%	4	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	20	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	4	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	380	3.4%	1	0.1%
120.400 RETINAL HEMORRHAGE	5	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	7	0.1%	0	0.0%
120.960 RETINOPATHY	12	0.1%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	3	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	103	0.9%	5	0.3%
OTHER				
900.000 OTHER, UNSPECIFIED	78	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	227	2.0%	2	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	284	2.6%	43	2.7%
NORMAL				
.000 NORMAL GLOBE	4,283	38.5%	359	22.9%

BASSET FAUVE DE BRETAGNE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma				
	- POAG	Autosomal recessive	2	NO	Mutation in the *ADAMTS17* gene
B.	Persistent pupillary membranes				
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

In the Basset Fauve de Bretagne, both closed angle (PCAG) and open angle (POAG) forms of glaucoma are present. Some Basset Fauve de Bretagnes have an abnormality of the iridocorneal angle termed goniodysgenesis. This abnormality is not visible during routine ophthalmologic examination using an indirect ophthalmoscope or a slit-lamp microscope. There appears to be an association between goniodysgenesis and glaucoma, but the mechanism by which the angle defect results in glaucoma has not been determined. It is suspected that mild to severe anterior uveitis impairs outflow of aqueous through the small perforations that are present in the sheet of tissue in the iridocorneal angle; this results in a secondary and often irreversible rise in intraocular pressure that causes blindness.

The inheritance of PCAG and goniodysgenesis in the Basset Fauve de Bretagne are not known. Until the inheritance is determined, control should be directed to removing dogs from breeding that have glaucoma and have goniodysgenesis, as well as those dogs that produce progeny affected with glaucoma. Three genetic loci, *COL1A2, RAB22A,* and *NEB,* have been implicated as possible contributors to the development of PCAG in the Basset Fauve de Bretagne. One is an autosomal recessive missense mutation of a nebulin (NEB) residue on chromosome 19. Because 33% of unaffected animals were homozygous for the risk allele, it was hypothesized that modifying factors may be present. A genetic test is not yet available for PCAG.

POAG in the Basset Fauve de Bretagne is caused by a 19 base pair deletion in exon 2 of *ADAMTS17.* This deletion alters the reading frame and is suspected to cause a truncated protein. The trait shows an autosomal recessive mode of inheritance. A DNA test is available.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Oliver JA, Forman OP, Pettitt L, et al. Two independent mutations in ADAMTS17 are associated with primary open angle glaucoma in the Basset Hound and Basset Fauve de Bretagne breeds of dog. *PloS one*. 2015;10:e0140436. PMID: 26474315

OCULAR DISORDERS REPORT
BASSET FAUVE DE BRETAGNE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	70		96	
	Diagnostic Name	**#**	**%**	**#**	**%**
GLOBE					
10.000	GLAUCOMA	2	2.9%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	1	1.4%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	0	0.0%	1	1.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	2.9%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	19	27.1%	6	6.3%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	6	8.6%	4	4.2%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	1.4%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	1.4%	2	2.1%
100.306	PUNCTATE CATARACT, NUCLEUS	1	1.4%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	1.4%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	1.4%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	0	0.0%	2	2.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	2.9%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	2	2.1%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***7***	***10.0%***	***4***	***4.2%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	1.4%	1	1.0%
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	5.7%	2	2.1%
NORMAL					
.000	NORMAL GLOBE	40	57.1%	83	86.5%

BASSET HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma				
	- PCAG	Not defined	2-6,8-9,11	NO	
	- POAG	Autosomal recessive	7,10	NO	Mutation in the *ADAMTS17* gene
B.	Entropion	Not defined	1	Breeder option	
C.	Ectropion	Not defined	1, 12	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to cornea	Not defined	1	NO	
E.	Cataract	Not defined	1	NO	

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

In the Basset Hound, both closed angle (PCAG) and open angle (POAG) forms of glaucoma are present. Some Basset Hounds have an abnormality of the iridocorneal angle termed goniodysgenesis. This abnormality is not visible during routine ophthalmologic examination using an indirect ophthalmoscope or a slit-lamp microscope. There appears to be an association between goniodysgenesis and glaucoma, but the mechanism by which the angle defect results in glaucoma has not been determined. It is suspected that mild to severe anterior uveitis impairs outflow of aqueous through the small perforations that are present in the sheet of tissue in the iridocorneal angle; this results in a secondary and often irreversible rise in intraocular pressure that causes blindness.

The inheritance of PCAG and goniodysgenesis in the Basset Hound are not known. Until the inheritance is determined, control should be directed to removing dogs from breeding that have glaucoma and have goniodysgenesis, as well as those dogs that produce progeny affected with glaucoma. Three genetic loci, *COL1A2, RAB22A,* and *NEB,* have been implicated as possible contributors to the development of PCAG in the Basset Hound. One is an autosomal recessive missense mutation of a nebulin (NEB) residue on chromosome 19. Because 33% of unaffected animals were homozygous for the risk allele, it was hypothesized that modifying factors may be present. A genetic test is not yet available for PCAG.

POAG in the Basset Hound is caused by a 19 base pair deletion in exon 2 of *ADAMTS17.* This deletion alters the reading frame and is suspected to cause a truncated protein. The trait shows an autosomal recessive mode of inheritance. A DNA test is available.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

In the Basset Hound, ectropion is associated with an exceptionally large palpebral fissure (macroblepharon) and laxity of the canthal structures. Central lower lid ectropion is often associated with entropion of the adjacent lid segment. This causes severe ocular irritation.

It is acknowledged that factors other than genetics may play a role or be the cause of entropion and/or ectropion. However, when non-genetic factors can be ruled out, selection should be directed to a more normal head conformation that minimizes or eliminates the likelihood of the defects.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Ahram DF, Cook AC, Kecova H, et al. Identification of genetic loci associated with primary angle-closure glaucoma in the basset hound. *Mol Vis*. 2014;20:497-510. PMID: 24791135

3. Bedford PG. The aetiology of primary glaucoma in the dog. *J Small Anim Pract*. 1975;16:217-239. PMID: 1142747

4. Bedford PGC. A gonioscopic study of the iridocorneal angle in the English and America breeds of Cocker Spaniel and the Bassest Hound. *J Small Anim Pract*. 1977;18:631-642. PMID: 604666

5. Slater MR, Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc*. 1986;188:1028-1030. PMID: 3710885

6. Martin CL, Wyman M. Glaucoma in the Basset Hound. *J Am Vet Med Assoc*. 1968;153:1320-1327. PMID: 5748475

7. Oliver JA, Forman OP, Pettitt L, et al. Two independent mutations in ADAMTS17 are associated with primary open angle glaucoma in the Basset Hound and Basset Fauve de Bretagne breeds of dog. *PloS one*. 2015;10:e0140436. PMID: 26474315

8. Ahram DF, Grozdanic SD, Kecova H, et al. Variants in Nebulin (NEB) Are Linked to the Development of Familial Primary Angle Closure Glaucoma in Basset Hounds. *PloS one*. 2015;10:e0126660. PMID: 25938837

9. Oliver JAC, Ricketts SL, Kuehn MH, Mellersh CS. Primary closed angle glaucoma in the Basset Hound: Genetic investigations using genome-wide association and RNA sequencing strategies. Mol Vis. 2019 Feb 8;25:93-105. PMID: 30820145

10. Jeanes EC, Oliver JAC, Ricketts SL, Gould DJ, Mellersh CS. Glaucoma-causing *ADAMTS17* mutations are also reproducibly associated with height in two domestic dog breeds: selection for short stature may have contributed to increased prevalence of glaucoma. Canine Genet Epidemiol. 2019 May 17;6:5. doi: 10.1186/s40575-019-0071-6. PMID: 31131111; PMCID: PMC6524303

11. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004;7:97-111. PMID: 14982589

12. Priester WA. Congenital ocular defects in cattle, horses, cats, and dogs. *J Am Vet Med Assoc*. 1972;160:1504-1511. PMID: 4623843

OCULAR DISORDERS REPORT
BASSET HOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,853		187	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.1%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.1%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	17	0.9%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	24	1.3%	6	3.2%
22.000	ECTROPION, UNSPECIFIED	134	7.2%	17	9.1%
25.110	DISTICHIASIS	25	1.3%	2	1.1%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.5%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	6	0.3%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	21	1.1%	2	1.1%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	10	0.5%	3	1.6%
CORNEA					
70.210	PANNUS	3	0.2%	0	0.0%
70.220	PIGMENTARY KERATITIS	3	0.2%	0	0.0%
70.700	CORNEAL DYSTROPHY	4	0.2%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	5	0.3%	0	0.0%
UVEA					
93.120	IRIS CYST	4	0.2%	0	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.1%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	54	2.9%	4	2.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	11	0.6%	2	1.1%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	28	1.5%	2	1.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	1	0.5%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.2%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	6	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	54	2.9%	10	5.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	19	1.0%	2	1.1%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	10	0.5%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.3%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.2%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	8	0.4%	2	1.1%
100.306	PUNCTATE CATARACT, NUCLEUS	4	0.2%	2	1.1%
100.307	PUNCTATE CATARACT, CAPSULAR	9	0.5%	3	1.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	7	0.4%	1	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	13	0.7%	1	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.1%	1	0.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	3	0.2%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	4	0.2%	1	0.5%
100.317	INCIPIENT CATARACT, CAPSULAR	4	0.2%	3	1.6%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.5%
100.326	INCOMPLETE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	0.5%
100.330	GENERALIZED/ COMPLETE CATARACT	5	0.3%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.1%	0	0.0%

OCULAR DISORDERS REPORT
BASSET HOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,853 #	 %	Year Examined: 2018-2022 Total # Dogs: 187 #	 %
LENS Continued				
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***107***	***5.8%***	***17***	***9.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	7	0.4%	0	0.0%
110.135 PHPV/ PTVL	1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	3	0.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	11	0.6%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2	0.1%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	1	0.1%	2	1.1%
OTHER				
900.000 OTHER, UNSPECIFIED	19	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	49	2.6%	1	0.5%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	103	5.6%	7	3.7%
NORMAL				
.000 NORMAL GLOBE	1,413	76.3%	135	72.2%

BAVARIAN MOUNTAIN SCENT HOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BAVARIAN MOUNTAIN SCENT HOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BAVARIAN MOUNTAIN SCENT HOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 13 #	 %	Year Examined: 2018-2022 Total # Dogs: 54 #	 %
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	1	1.9%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	3	5.6%
NORMAL				
.000 NORMAL GLOBE	13	100.0%	50	92.6%

BEAGLE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia with multiple ocular defects	See below	1, 2	NO	
B.	Glaucoma				
	- PCAG	Not defined	14	NO	
	- POAG	Presumed autosomal recessive	3-13,15-17	NO	Mutation in the *ADAMTS10* gene
C.	Distichiasis	Not defined	1	Breeder option	
D.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
E.	Corneal dystrophy				
	- epithelial/stromal	Not defined	18-23	Breeder option	
F.	Cataract	Not defined	1, 24, 25	NO	
G.	Tapetal degeneration	Presumed autosomal recessive	26-29	Breeder option	
H.	Retinal dysplasia				
	- folds	Not defined	1, 32	Breeder option	
I.	Congenital stationary night blindness	Autosomal recessive	30,31	NO	Mutation in the *LRIT3* gene

Description and Comments

A. Microphthalmia with multiple congenital ocular defects

A developmental anomaly in which the eyeball is abnormally small. This is often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens, and/or retina.

In the Beagle, the condition may be present unilaterally or bilaterally and is characterized by a small globe and associated ocular defects which are variable. Several forms of the condition, all apparently different, are recognized:

1) In one study, complete lens opacities were noted by 5-6 months of age; the severity of the cataract correlated closely with the extent of microphthalmia. Severely microphthalmic eyes also had multiple retinal folds. The disorder appeared to be inherited; the exact mode was not fully defined, although an X-linked disorder could not be ruled out.

2) A different form of microphthalmia is recognized in association with microphakia and persistent pupillary

membrane (PPM). Based on a limited pedigree of one cross, a dominant inheritance was proposed; heterozygotes have PPM and microphakia/cataract and homozygous affected show microphthalmia and multiple congenital ocular anomalies.

3) A third form of microphthalmia is recognized in the breed. This condition is usually unilateral and the fellow eye is normal. The mode of inheritance has not been defined, but autosomal recessive inheritance is suspected.

B. Glaucoma

Glaucoma is an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

Primary open angle glaucoma is present in the breed, and extensive breeding studies have demonstrated its inheritance as autosomal recessive. By one year of age, the intraocular pressure (IOP) is elevated, but the filtration angle is open (early glaucoma). Animals with moderate glaucoma show sustained elevations of IOP, focal disinsertions of the lens zonules and focal closures of the iridocorneal angle. Later the globe enlarges, the lens luxates and the eyes become blind and show the effects of chronic glaucoma. The causative mutation in *ADAMTS10* causes an arginine for glycine substitution at position 661. A DNA test is available.

Primary closed angle glaucoma has also been reported in the Beagle.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

E. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

In the Beagle, corneal dystrophy has been described as an oval opacity located at the junction at the middle and inferior thirds of the cornea. The opacities are caused by accumulation of cholesterol and other lipids within the cornea. Progression was noted with possible vision impairment.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Several different types of cataract (anterior capsular, posterior cortical, other) have been reported in the Beagle, but the mode of inheritance of the defects is unknown. When one considers that this breed, particularly the laboratory-bred Beagle, has been the subject of extensive ophthalmological examination, the relatively low incidence of cataracts is surprising.

G. Tapetal degeneration

The tapetum lucidum is a modified choroidal structure present in the eyes of many animals that have good night vision. In Beagles there is a recessively inherited defect of the tapetal layer. Absence of this layer is determined by ophthalmoscopy which shows that the fundus has a uniform reddish coloration. The degeneration of the tapetum occurs as a result of abnormal postnatal development of this structure. The degeneration of the tapetum does not affect vision and does not result in functional or structural damage to the retina. As such, the condition probably represents an insignificant inherited variation of no functional significance.

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

I. Congenital stationary night blindness (CSNB)

A non-progressive retinal disease characterized by night blindness; day vision is normal. This condition was initially described in a research colony in Japan, and in 2018 was documented in a Beagle obtained from a commercial breeding facility in the USA (Oh et al). Genomic analysis has concluded that this disease is rare in the wider Beagle population. The condition is inherited in an autosomal recessive manner. Affected dogs had normal retinas on clinical examination, but no detectable rod photoreceptor responses with an electroretinogram (ERG). A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Anderson AC, Shultz FT. Inherited (congenital) cataract in the dog. *Am J Path*. 1958;34:956-975.
3. Gelatt KN. Familial glaucoma in the Beagle dog. *J Am Anim Hosp Assoc*. 1972;8:23-28.
4. Gelatt KN, Peiffer RL, Jr., Gwin RM, et al. Clinical manifestations of inherited glaucoma in the beagle. *Invest Ophthalmol Vis Sci*. 1977;16:1135-1142. PMID: 924743
5. Peiffer RL, Jr., Gum GG, Grimson RC, et al. Aqueous humor outflow in beagles with inherited glaucoma: constant pressure perfusion. *Am J Vet Res*. 1980;41:1808-1813. PMID: 6969052
6. Gelatt KN, Gum GG. Inheritance of primary glaucoma in the beagle. *Am J Vet Res*. 1981;42:1691-1693. PMID: 73254307.
7. Brooks DE, Samuelson DA, Gelatt KN. Ultrastructural changes in laminar optic nerve capillaries of beagles with primary open-angle glaucoma. *Am J Vet Res*. 1989;50:929-935. PMID: 2764345
8. Brooks DE, Samuelson DA, Gelatt KN, et al. Morphologic changes in the lamina cribrosa of

beagles with primary open-angle glaucoma. *Am J Vet Res*. 1989;50:936-941. PMID: 2764346

9. Samuelson DA, Gum GG, Gelatt KN. Ultrastructural changes in the aqueous outflow apparatus of beagles with inherited glaucoma. *Invest Ophthalmol Vis Sci*. 1989;30:550-561. PMID: 2925324

10. Brooks DE, Strubbe DT, Kubilis PS, et al. Histomorphometry of the optic nerves of normal dogs and dogs with hereditary glaucoma. *Exp Eye Res*. 1995;60:71-89. PMID: 7720807

11. Gum GG, Gelatt KN, Knepper PA. Histochemical localization of glycosaminoglycans in the aqueous outflow pathways in normal beagles and beagles with inherited glaucoma. *Prog Vet Comp Ophthalmol*. 1993;3:52-57.

12. Gelatt KN, Gum GG, MacKay EO, et al. Estimations of aqueous humor outflow facility by pneumotonography in the normal, genetic carrier and glaucomatous beagles. *Vet Comp Ophthalmol*. 1996;6:148-151.

13. Park, S. A., et al. (2019). "Primary angle-closure glaucoma with goniodysgenesis in a Beagle dog." *BMC Vet Res* 15(1): 75. PMID: 30832652 PMID: 30832652

14. Kuchtey J, Olson LM, Rinkoski T, et al. Mapping of the disease locus and identification of ADAMTS10 as a candidate gene in a canine model of primary open angle glaucoma. *PLoS Genet*. 2011;7:e1001306. PMID: 21379321

15. Kuchtey J, Kunkel J, Esson D, Sapienza JS, Ward DA, Plummer CE, Gelatt KN, Kuchtey RW. Screening ADAMTS10 in dog populations supports Gly661Arg as the glaucoma-causing variant in beagles. *Invest Ophthalmol Vis Sci.* 2013 Mar 13;54(3):1881-6. doi: 10.1167/iovs.12-10796. PMID: 23422823

16. Jeanes EC, Oliver JAC, Ricketts SL, Gould DJ, Mellersh CS. Glaucoma-causing *ADAMTS17* mutations are also reproducibly associated with height in two domestic dog breeds: selection for short stature may have contributed to increased prevalence of glaucoma. *Canine Genet Epidemiol.* 2019 May 17;6:5. doi: 10.1186/s40575-019-0071-6. PMID: 31131111; PMCID: PMC6524303-consider removing this reference

17. American Kennel Club Genetic Disease Registry. Univ of Penn, 1989.

18. Roth AM, Ekins MB, Waring GO, et al. Oval corneal opacities in beagles. III. Histochemical demonstration of stromal lipids without hyperlipidemia. *Invest Ophthalmol Vis Sci*. 1981;21:95-106. PMID: 7251305

19. Ekins MB, Sgoutas DS, Waring GO, et al. Oval lipid corneal opacities in beagles: VI. Quantitation of excess stromal cholesterol and phospholipid. *Exp Eye Res*. 1983;36:279-286. PMID: 6825741

20. Morrin LA, Waring GO, Spangler W. Oval lipid corneal opacities in beagles: ultrastructure of normal beagle cornea. *Am J Vet Res*. 1982;43:443-453. PMID: 7073060

21. Spangler WL, Waring GO, Morrin LA. Oval corneal opacities in Beagles, V. Ultrastructure. *Vet Pathol*. 1982;19:150-159. PMID: 7072087

22. Waring GO, Elkins MB, Spangler W. Oval lipid corneal opacities in beagles and crystalline lipid corneal opacities in Siberian Huskies. *Metab Pediatr Ophthalmol*. 1979;3:203.

23. Heywood R. Juvenile cataracts in the Beagle dog. *J Small Anim Pract*. 1971;12:171-177. PMID: 5551929

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24. Hirth RS, Greenstein ET, Peer RL. Anterior capsular opacities (spurious cataracts) in Beagle dogs. *Vet Pathol*. 1974;11:181-194. PMID: 4476103

25. Belhorn RW, Bellhorn MB, Swarm RL, et al. Hereditary tapetal abnormality in the Beagle. *Ophtho Res*. 1975;7:250-260.

26. Wen GY, Sturman JA, Wisniewski HM, et al. Chemical and ultrastructural changes in the tapetum of Beagles with a hereditary abnormality. *Invest Ophthalmol Vis Sci*. 1982;23:733-742. PMID: 6815125

27. Burns MS, Bellhorn RW, Impellizzeri CW, et al. Development of hereditary tapetal degeneration in the beagle dog. *Curr Eye Res*. 1988;7:103-114. PMID: 3371063

28. Burns MS, Tyler NK, Bellhorn RW. Melanosome abnormalities of ocular pigmented epithelial cells in beagle dogs with hereditary tapetal degeneration. *Curr Eye Res*. 1988;7:115-123. PMID: 3371064

29. Oh, A., et al. (2018). "Phenotypic characterization of complete CSNB in the inbred research beagle: how common is CSNB in research and companion dogs?" *Doc Ophthalmol.* 2018; 137(2): 87-101. PMID: 30051304.

30. Das RG, Becker D, Jagannathan V, Goldstein O, Santana E, Carlin K, Sudharsan R, Leeb T, Nishizawa Y, Kondo M, Aguirre GD, Miyadera K. Genome-wide association study and whole-genome sequencing identify a deletion in LRIT3 associated with canine congenital stationary night blindness. Sci Rep. 2019 Oct 2;9(1):14166. doi: 10.1038/s41598-019-50573-7. PMID: 31578364

31. Heywood R, Wells GAH. A retinal dysplasia in the Beagle dog. *Veterinary Record.* 1970; 87: 178-180 PMID: 5528620

OCULAR DISORDERS REPORT
BEAGLE

Diagnostic Name	1993-2017 #	1993-2017 %	2018-2022 #	2018-2022 %
Year Examined:	**1993-2017**		**2018-2022**	
Total # Dogs:	**1,754**		**606**	
GLOBE				
.110 MICROPHTHALMIA	4	0.2%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.2%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	4	0.2%	2	0.3%
22.000 ECTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110 DISTICHIASIS	315	18.0%	98	16.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	3	0.5%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	6	0.3%	6	1.0%
40.910 KERATOCONJUNCTIVITIS SICCA	3	0.2%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	11	0.6%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY	7	0.4%	1	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	1	0.2%
UVEA				
93.120 IRIS CYST	2	0.1%	2	0.3%
93.150 IRIS COLOBOMA	0	0.0%	1	0.2%
93.170 ANTERIOR CHAMBER CYST	1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	20	1.1%	6	1.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	1	0.2%
95.120 CILIARY BODY CYST	1	0.1%	2	0.3%
LENS				
100.200 CATARACT, UNSPECIFIED	9	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	51	2.9%	16	2.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	13	0.7%	2	0.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	6	0.3%	1	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.1%	4	0.7%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	6	0.3%	1	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	3	0.2%	2	0.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.2%	6	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	14	0.8%	2	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.4%	4	0.7%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	4	0.2%	2	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.1%	1	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	1	0.1%	1	0.2%
100.330 GENERALIZED/ COMPLETE CATARACT	19	1.1%	1	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***97***	***5.5%***	***27***	***4.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
BEAGLE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,754 #	 %	Year Examined: 2018-2022 Total # Dogs: 606 #	 %
VITREOUS Continued				
110.135 PHPV/ PTVL	1	0.1%	1	0.2%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	5	0.3%	1	0.2%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	3	0.5%
130.110 MICROPAPILLA	0	0.0%	1	0.2%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	34	1.9%	2	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	6	0.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	8	0.5%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	4	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	18	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	44	2.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	28	1.6%	24	4.0%
NORMAL				
.000 NORMAL GLOBE	1,291	73.6%	448	73.9%

BEARDED COLLIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO
D.	Y suture tip opacity	Not defined	1	Breeder option
E.	Retinal dysplasia - folds	Not defined	1	Breeder option
F.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Not defined	1	NO

Description and Comments

A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so

there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.

These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached), which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

F. Choroidal hypoplasia (Collie Eye Anomaly)
- Staphyloma/coloboma
- Retinal detachment
- Retinal hemorrhage
- Optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." A genetic mutation associated with this disorder in this breed has not been described.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BEARDED COLLIE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	4,014		392	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	2	0.0%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	29	0.7%	5	1.3%
CORNEA					
70.700	CORNEAL DYSTROPHY	51	1.3%	5	1.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA					
93.120	IRIS CYST	6	0.1%	1	0.3%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	165	4.1%	16	4.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	9	0.2%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.0%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.0%	3	0.8%
93.810	UVEAL MELANOMA	0	0.0%	1	0.3%
95.120	CILIARY BODY CYST	3	0.1%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	22	0.5%	4	1.0%
97.120	COLOBOMA	4	0.1%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	5	1.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.5%
LENS					
100.200	CATARACT, UNSPECIFIED	12	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	406	10.1%	45	11.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	60	1.5%	15	3.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	16	0.4%	4	1.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	35	0.9%	6	1.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	6	0.1%	2	0.5%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	40	1.0%	10	2.6%
100.306	PUNCTATE CATARACT, NUCLEUS	9	0.2%	5	1.3%
100.307	PUNCTATE CATARACT, CAPSULAR	22	0.5%	10	2.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	41	1.0%	3	0.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	36	0.9%	2	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	26	0.6%	8	2.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.1%	1	0.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	14	0.3%	1	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	16	0.4%	4	1.0%
100.317	INCIPIENT CATARACT, CAPSULAR	10	0.2%	3	0.8%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.1%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	20	0.5%	13	3.3%
100.330	GENERALIZED/ COMPLETE CATARACT	5	0.1%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	6	0.1%	1	0.3%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***357***	***8.9%***	***74***	***18.9%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	6	0.1%	1	0.3%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	6	0.1%	1	0.3%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	52	1.3%	0	0.0%

OCULAR DISORDERS REPORT
BEARDED COLLIE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4,014 #	 %	Year Examined: 2018-2022 Total # Dogs: 392 #	 %
RETINA Continued				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.0%	1	0.3%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	8	0.2%	0	0.0%
120.960 RETINOPATHY	2	0.0%	0	0.0%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	37	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	73	1.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	44	1.1%	17	4.3%
NORMAL				
.000 NORMAL GLOBE	3,203	79.8%	279	71.2%

BEAUCERON

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
B.	Cataracts	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BEAUCERON

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	242		582	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.4%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	2	0.8%	6	1.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	0	0.0%	1	0.2%
CORNEA					
70.210	PANNUS	1	0.4%	0	0.0%
70.700	CORNEAL DYSTROPHY	1	0.4%	1	0.2%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	7	2.9%	34	5.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.4%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	1	0.2%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	15	6.2%	50	8.6%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	7	2.9%	16	2.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.4%	4	0.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.4%	1	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	1.2%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	3	1.2%	3	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR	2	0.8%	10	1.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	2	0.8%	1	0.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	2	0.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.2%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.8%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.4%	1	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.4%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.2%
100.328	Y-SUTURE TIP OPACITIES	2	0.8%	1	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.4%	1	0.2%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***16***	***6.6%***	***24***	***4.1%***
VITREOUS					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	1	0.2%
110.320	VITREOUS DEGENERATION SYNERESIS	6	2.5%	1	0.2%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.3%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	1	0.4%	3	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.4%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	3	1.2%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	6	2.5%	22	3.8%
NORMAL					
.000	NORMAL GLOBE	195	80.6%	450	77.3%

BEDLINGTON TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BEDLINGTON TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,701		309	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	5	0.3%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	2	0.1%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	2	0.1%	0	0.0%
25.110	DISTICHIASIS	132	7.8%	12	3.9%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	13	0.8%	2	0.6%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
CORNEA					
70.220	PIGMENTARY KERATITIS	1	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	7	0.4%	1	0.3%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	145	8.5%	32	10.4%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.3%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	3	0.2%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	13	0.8%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	125	7.3%	11	3.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	16	0.9%	5	1.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	5	0.3%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	15	0.9%	1	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.2%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	34	2.0%	10	3.2%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.1%	1	0.3%
100.307	PUNCTATE CATARACT, CAPSULAR	7	0.4%	2	0.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	39	2.3%	1	0.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	18	1.1%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	32	1.9%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	4	0.2%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	9	0.5%	1	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	4	0.2%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	6	0.4%	3	1.0%
100.330	GENERALIZED/ COMPLETE CATARACT	15	0.9%	1	0.3%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***219***	***12.9%***	***22***	***7.1%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	2	0.6%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	5	0.3%	1	0.3%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	10	0.6%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.2%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
120.960	RETINOPATHY	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
BEDLINGTON TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,701 #	 %	Year Examined: 2018-2022 Total # Dogs: 309 #	 %
OPTIC NERVE				
130.110 MICROPAPILLA	0	0.0%	2	0.6%
130.120 OPTIC NERVE HYPOPLASIA	1	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	5	0.3%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	13	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	34	2.0%	1	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	19	1.1%	9	2.9%
NORMAL				
.000 NORMAL GLOBE	1,255	73.8%	233	75.4%

BELGIAN LAEKENOIS

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct, thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataracts	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BELGIAN LAEKENOIS

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 173 #	 %	Year Examined: 2018-2022 Total # Dogs: 80 #	 %
EYELIDS				
25.110 DISTICHIASIS	5	2.9%	0	0.0%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	0	0.0%	2	2.5%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	0.6%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	1.2%	1	1.3%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.6%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	17	9.8%	5	6.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	2	1.2%	3	3.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	1.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.6%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.6%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.6%	1	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	2	2.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	3	3.8%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.6%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	1.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	2	2.5%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***6***	***3.5%***	***14***	***17.5%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.6%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	4	2.3%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	6	3.5%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	1.3%
FUNDUS				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	3	3.8%
120.960 RETINOPATHY	0	0.0%	2	2.5%
OTHER				
900.000 OTHER, UNSPECIFIED	4	2.3%	0	0.0%
900.100 OTHER, NOT INHERITED	4	2.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	1.2%	3	3.8%
NORMAL				
.000 NORMAL GLOBE	143	82.7%	60	75.0%

BELGIAN MALINOIS

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct, thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
B	Y suture tip opacity	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

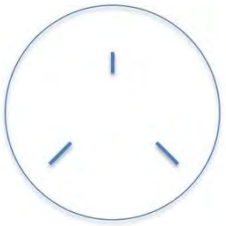
Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Belgian Malinois, cataract most often occurs as a non-progressive, triangular opacity in the posterior cortex.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BELGIAN MALINOIS

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,926 #	%	2018-2022 1,021 #	%
GLOBE				
.110 MICROPHTHALMIA	2	0.1%	0	0.0%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	0	0.0%	1	0.1%
22.000 ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110 DISTICHIASIS	3	0.1%	2	0.2%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	1	0.0%	0	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY	1	0.0%	2	0.2%
CORNEA				
70.210 PANNUS	10	0.3%	3	0.3%
70.220 PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	17	0.6%	6	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	9	0.3%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	33	1.1%	25	2.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	0	0.0%	1	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.0%	2	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	1	0.1%
FUNDUS				
97.120 COLOBOMA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	3	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	129	4.4%	58	5.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	29	1.0%	23	2.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	13	0.4%	6	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.1%	2	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	8	0.3%	4	0.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	23	0.8%	7	0.7%
100.306 PUNCTATE CATARACT, NUCLEUS	7	0.2%	10	1.0%
100.307 PUNCTATE CATARACT, CAPSULAR	5	0.2%	8	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	15	0.5%	8	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	24	0.8%	7	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.2%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	8	0.3%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	10	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	17	0.6%	9	0.9%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.1%	3	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	2	0.2%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	8	0.3%	12	1.2%
100.330 GENERALIZED/ COMPLETE CATARACT	6	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***183***	***6.3%***	***93***	***9.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	0.1%	3	0.3%

OCULAR DISORDERS REPORT
BELGIAN MALINOIS

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,926 #	%	Year Examined: 2018-2022 Total # Dogs: 1,021 #	%
VITREOUS Continued				
110.135 PHPV/ PTVL	2	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.1%	1	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	20	0.7%	5	0.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	26	0.9%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	6	0.2%	1	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	13	0.4%	1	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	4	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	4	0.1%	0	0.0%
120.960 RETINOPATHY	1	0.0%	3	0.3%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	2	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	21	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	78	2.7%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	41	1.4%	49	4.8%
NORMAL				
.000 NORMAL GLOBE	2,584	88.3%	848	83.1%

BELGIAN SHEEPDOG

(BELGIAN SHEPHERD-GROENENDAEL)

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct, thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Chronic superficial keratitis/pannus	Not defined	1	NO
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO
D.	Achiasmic optic nerves with nystagmus	Autosomal recessive	2	NO

Description and Comments

A. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.
In the Belgian Sheepdog, cataract most often occurs as a non-progressive, triangular opacity in the posterior cortex.

D. Achiasmatic optic nerves with nystagmus

Achiasmatic optic nerves with nystagmus have been described in a small family of black Belgian

Sheepdogs. Congenital nystagmus is the clinical sign most commonly noted. All retinal ganglion cell axons extend directly into the ipsilateral optic disc with no chiasmal decussation. No optic nerve hypoplasia/micropapilla was noted in the animals studied and reported.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Hogan D and Williams RW. Analysis of the retinas and optic nerves of achiasmatic Belgian sheepdogs. *The Journal of comparative neurology.* 1995 Feb 13;352:367-380. PMID: 7706558

OCULAR DISORDERS REPORT
BELGIAN SHEEPDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 6,079 #	%	2018-2022 912 #	%
GLOBE				
10.000 GLAUCOMA	1	0.0%	0	0.0%
EYELIDS				
22.000 ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110 DISTICHIASIS	13	0.2%	1	0.1%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	6	0.1%	3	0.3%
51.100 THIRD EYELID CARTILAGE ANOMALY	3	0.0%	1	0.1%
CORNEA				
70.210 PANNUS	60	1.0%	11	1.2%
70.220 PIGMENTARY KERATITIS	3	0.0%	8	0.9%
70.700 CORNEAL DYSTROPHY	34	0.6%	5	0.5%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA				
93.120 IRIS CYST	3	0.0%	1	0.1%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	447	7.4%	71	7.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.1%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	5	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	14	0.2%	6	0.7%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	3	0.0%	0	0.0%
95.120 CILIARY BODY CYST	0	0.0%	1	0.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	0	0.0%
FUNDUS				
97.120 COLOBOMA	2	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	13	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	213	3.5%	40	4.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	38	0.6%	13	1.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	48	0.8%	11	1.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	5	0.1%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	4	0.1%	3	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	22	0.4%	2	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS	8	0.1%	2	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR	18	0.3%	11	1.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	26	0.4%	6	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	60	1.0%	14	1.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	13	0.2%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	4	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	14	0.2%	4	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS	11	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	6	0.1%	4	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	2	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.0%	1	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	8	0.1%	5	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT	7	0.1%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***300***	***4.9%***	***76***	***8.3%***

OCULAR DISORDERS REPORT
BELGIAN SHEEPDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 6,079 #	 %	Year Examined: 2018-2022 Total # Dogs: 912 #	 %
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	3	0.0%	3	0.3%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	3	0.0%	1	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	38	0.6%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	7	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	4	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.0%	0	0.0%
120.960 RETINOPATHY	0	0.0%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	29	0.5%	5	0.5%
130.120 OPTIC NERVE HYPOPLASIA	14	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	5	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	54	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	113	1.9%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	64	1.1%	53	5.8%
NORMAL				
.000 NORMAL GLOBE	5,166	85.0%	692	75.9%

BELGIAN TERVUREN

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct, thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Chronic superficial keratitis/pannus	Not defined	1, 2	NO
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO

Description and Comments

A. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans which may also occur independent of corneal disease.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Belgian Tervuren, cataract most often occurs as a non-progressive, triangular opacity in the posterior cortex.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Chavkin MJ, Roberts SM, Salman MD, et al. Risk factors for development of chronic superficial keratitis in dogs. *J Am Vet Med Assoc*. 1994 May 15;204:1630-1634. PMID: 8050943

OCULAR DISORDERS REPORT
BELGIAN TERVUREN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 13,342 #	%	2018-2022 1,838 #	%
GLOBE				
.110 MICROPHTHALMIA	4	0.0%	0	0.0%
10.000 GLAUCOMA	1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	2	0.1%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	3	0.0%	0	0.0%
25.110 DISTICHIASIS	117	0.9%	9	0.5%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	2	0.0%	0	0.0%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	7	0.1%	8	0.4%
51.100 THIRD EYELID CARTILAGE ANOMALY	21	0.2%	3	0.2%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	100	0.7%	19	1.0%
70.220 PIGMENTARY KERATITIS	8	0.1%	3	0.2%
70.700 CORNEAL DYSTROPHY	73	0.5%	7	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	7	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	15	0.1%	0	0.0%
93.150 IRIS COLOBOMA	2	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1,042	7.8%	208	11.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	13	0.1%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	14	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	40	0.3%	33	1.8%
93.810 UVEAL MELANOMA	2	0.0%	2	0.1%
95.120 CILIARY BODY CYST	1	0.0%	1	0.1%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
97.120 COLOBOMA	2	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.1%
130.110 MICROPAPILLA	0	0.0%	7	0.4%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	2	0.1%
130.150 OPTIC DISC COLOBOMA	0	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	66	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	714	5.4%	134	7.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	146	1.1%	67	3.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	103	0.8%	32	1.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	21	0.2%	10	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	10	0.1%	12	0.7%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	50	0.4%	7	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS	12	0.1%	11	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR	49	0.4%	30	1.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	66	0.5%	15	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	146	1.1%	30	1.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	23	0.2%	9	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	6	0.0%	1	0.1%

OCULAR DISORDERS REPORT
BELGIAN TERVUREN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 13,342 #	 %	2018-2022 1,838 #	 %
LENS Continued				
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	30	0.2%	5	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	4	0.0%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	20	0.1%	8	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.0%	4	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	16	0.1%	11	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT	12	0.1%	2	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***768***	***5.8%***	***246***	***13.4%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	12	0.1%	8	0.4%
110.135 PHPV/ PTVL	3	0.0%	1	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.0%	1	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	33	0.2%	9	0.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	42	0.3%	2	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	13	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	23	0.2%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	3	0.0%	3	0.2%
OPTIC NERVE				
130.110 MICROPAPILLA	131	1.0%	10	0.5%
130.120 OPTIC NERVE HYPOPLASIA	95	0.7%	1	0.1%
130.150 OPTIC DISC COLOBOMA	4	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	107	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	251	1.9%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	193	1.4%	108	5.9%
NORMAL				
.000 NORMAL GLOBE	10,988	82.4%	1,280	69.6%

BERGAMASCO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BERGAMASCO breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BERGAMASCO

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	7		9	
Diagnostic Name		**#**	**%**	**#**	**%**
CORNEA					
70.700	CORNEAL DYSTROPHY	1	14.3%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	6	85.7%	9	100.0%

BERGER DE PYRENEES

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BERGER DE PYRENEES breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BERGER DES PYRENEES

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3 #	 %	Year Examined: 2018-2022 Total # Dogs: 10 #	 %
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	2	20.0%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	33.3%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	2	66.7%	8	80.0%

BERGER PICARD

(PICARDY SHEPHERD, PICARDIE)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
C.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
E.	Cataract	Not defined	1	NO
F.	Y suture tip opacity	Not defined	1	Breeder option
G.	Retinal atrophy			
	- generalized	Not defined	1	NO
H.	Retinal dysplasia - folds	Not defined	1	Breeder option
I.	Retinopathy	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

C. Corneal dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.

These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality is also known as progressive retinal atrophy or PRA, and may be detected by electroretinogram (not part of a routine eye screening examination) before there are detectable funduscopic changes seen by ophthalmoscopy. There are multiple genetic types of PRA including the rod cone dysplasias described elsewhere.

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

I. Retinopathy

A lesion similar to canine multifocal retinopathy has been noted in the Berger Picard. The lesions initially appear as multifocal sub-retinal fluid elevations that over time may become hyper-reflective lesions.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BERGER PICARD

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,107		733	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	0	0.0%	1	0.1%
EYELIDS					
25.110	DISTICHIASIS	81	7.3%	49	6.7%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	2	0.2%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	21	1.9%	14	1.9%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	0	0.0%	3	0.4%
CORNEA					
70.700	CORNEAL DYSTROPHY	19	1.7%	16	2.2%
UVEA					
90.250	PIGMENTARY UVEITIS	1	0.1%	0	0.0%
93.120	IRIS CYST	2	0.2%	1	0.1%
93.150	IRIS COLOBOMA	0	0.0%	1	0.1%
93.170	ANTERIOR CHAMBER CYST	1	0.1%	2	0.3%
93.180	IIRIS SPHINCTER DYSPLASIA	0	0.0%	1	0.1%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	246	22.2%	54	7.4%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	2	0.3%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
93.810	UVEAL MELANOMA	1	0.1%	0	0.0%
95.120	CILIARY BODY CYST	1	0.1%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	126	11.4%	66	9.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	7	0.6%	13	1.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	5	0.5%	4	0.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	3	0.3%	1	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	2	0.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	83	7.5%	46	6.3%
100.306	PUNCTATE CATARACT, NUCLEUS	6	0.5%	5	0.7%
100.307	PUNCTATE CATARACT, CAPSULAR	11	1.0%	13	1.8%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	4	0.4%	6	0.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	10	0.9%	9	1.2%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.2%	4	0.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	18	1.6%	16	2.2%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	2	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.2%	4	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.2%	1	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	5	0.5%	2	0.3%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	3	0.4%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.1%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	69	6.2%	70	9.5%
100.330	GENERALIZED/ COMPLETE CATARACT	0	0.0%	1	0.1%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***162***	***14.6%***	***133***	***18.1%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	7	0.6%	3	0.4%
110.320	VITREOUS DEGENERATION SYNERESIS	1	0.1%	0	0.0%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	24	3.3%

OCULAR DISORDERS REPORT
BERGER PICARD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,107 #	 %	Year Examined: 2018-2022 Total # Dogs: 733 #	 %
FUNDUS Continued				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	3	0.4%
120.190 RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	6	0.8%
120.960 RETINOPATHY	0	0.0%	2	0.3%
120.970 CMR/ CMR-LIKE RETINOPATHY	0	0.0%	9	1.2%
130.110 MICROPAPILLA	0	0.0%	1	0.1%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	197	17.8%	44	6.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	8	0.7%	3	0.4%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	20	1.8%	11	1.5%
120.960 RETINOPATHY	48	4.3%	21	2.9%
120.970 CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.1%	1	0.1%
130.150 OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	25	2.3%	0	0.0%
900.100 OTHER, NOT INHERITED	21	1.9%	2	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	47	4.2%	46	6.3%
NORMAL				
.000 NORMAL GLOBE	510	46.1%	387	52.8%

BERNESE MOUNTAIN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Retinal atrophy			
	- generalized	Not defined	2	NO

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and

affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

In the Bernese Mountain Dog, one French report found the early onset retinopathy to be functionally and electroretinographically similar to the retinal dystrophy seen in the Briard.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Chaudieu G and Molon-Noblot S. Early retinopathy in the Bernese Mountain Dog in France: preliminary observations. *Vet Ophthalmol*. 2004 May-Jun;7:175-184. PMID: 15091325 **non-USA dog population**

OCULAR DISORDERS REPORT
BERNESE MOUNTAIN DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 17,397 #	%	2018-2022 3,411 #	%
GLOBE				
.110 MICROPHTHALMIA	7	0.0%	0	0.0%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	25	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	258	1.5%	46	1.3%
22.000 ECTROPION, UNSPECIFIED	111	0.6%	15	0.4%
25.110 DISTICHIASIS	164	0.9%	38	1.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	0	0.0%	2	0.1%
51.100 THIRD EYELID CARTILAGE ANOMALY	43	0.2%	6	0.2%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	2	0.1%
CORNEA				
70.210 PANNUS	3	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	68	0.4%	15	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	4	0.0%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	1	0.0%	0	0.0%
93.120 IRIS CYST	50	0.3%	4	0.1%
93.150 IRIS COLOBOMA	8	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	4	0.0%	3	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	659	3.8%	177	5.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	15	0.1%	5	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	7	0.0%	5	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	5	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	27	0.2%	36	1.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	11	0.1%	2	0.1%
95.120 CILIARY BODY CYST	2	0.0%	1	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	5	0.1%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
120.960 RETINOPATHY	0	0.0%	2	0.1%
130.110 MICROPAPILLA	0	0.0%	2	0.1%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	2	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	6	0.0%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,027	5.9%	171	5.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	173	1.0%	70	2.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	110	0.6%	23	0.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	59	0.3%	17	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	23	0.1%	9	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	41	0.2%	14	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS	50	0.3%	25	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR	56	0.3%	44	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	61	0.4%	16	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	182	1.0%	23	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	111	0.6%	19	0.6%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	9	0.1%	2	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	30	0.2%	4	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	37	0.2%	20	0.6%

OCULAR DISORDERS REPORT
BERNESE MOUNTAIN DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 17,397 #	 %	Year Examined: 2018-2022 Total # Dogs: 3,411 #	 %
LENS Continued				
100.317 INCIPIENT CATARACT, CAPSULAR	60	0.3%	16	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	2	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.0%	3	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	4	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	4	0.0%	10	0.3%
100.327 INCOMPLETE CATARACT, CAPSULAR	3	0.0%	1	0.0%
100.328 Y-SUTURE TIP OPACITIES	8	0.0%	10	0.3%
100.330 GENERALIZED/ COMPLETE CATARACT	29	0.2%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	2	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.1%	1	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,056***	***6.1%***	***319***	***9.4%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	27	0.2%	14	0.4%
110.135 PHPV/ PTVL	9	0.1%	5	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	7	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	23	0.1%	1	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	39	0.2%	5	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	8	0.0%	1	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	3	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	51	0.3%	0	0.0%
120.400 RETINAL HEMORRHAGE	2	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
120.960 RETINOPATHY	6	0.0%	6	0.2%
OPTIC NERVE				
130.110 MICROPAPILLA	21	0.1%	7	0.2%
130.120 OPTIC NERVE HYPOPLASIA	32	0.2%	4	0.1%
130.150 OPTIC DISC COLOBOMA	22	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	193	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	457	2.6%	1	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	217	1.2%	105	3.1%
NORMAL				
.000 NORMAL GLOBE	14,826	85.2%	2,711	79.5%

BICHON FRISE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
E.	Cataract	Not defined	1-3	NO
F.	Y suture tip opacity	Not defined	1	Breeder option
G.	Vitreous degeneration	Not defined	1	Breeder option
	- syneresis			

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Bichon Frise, many of these strands bridge between the iris and cornea where they may be associated with corneal opacities and vision impairment.

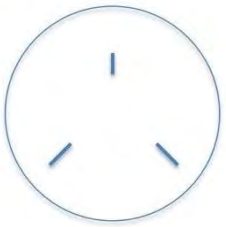
E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The range in age of animals affected with cataracts in one study was 1-2 years to 9-10 years old, with the peak age of 3 years old. The cataracts involved all regions of the lens, but in age groups of 2-4 years old, the predominant regions affected were the posterior cortex, and the anterior and posterior cortices combined. The earliest abnormalities usually consisted of small punctate opacities in the paracentral posterior cortex, independent of the posterior lens sutures.

F. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

G. Vitreous degeneration - syneresis

Liquefaction of the vitreous gel which may predispose to retinal detachment.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gelatt KN, Wallace MR, Andrew SE, et al. Cataracts in the Bichon Frise. *Vet Ophthalmol*. 2003 Mar;6:3-9. PMID: 12641835

3. Schmidt GM and Vainisi SJ. Retrospective study of prophylactic random transscleral retinopexy in the Bichon Frise with cataract. *Vet Ophthalmol*. 2004 Sep-Oct;7:307-310. PMID: 15310289

OCULAR DISORDERS REPORT
BICHON FRISE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	10,522		1,748	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	2	0.0%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.1%
EYELIDS					
20.140	ECTOPIC CILIA	2	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	8	0.1%	18	1.0%
22.000	ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110	DISTICHIASIS	384	3.6%	78	4.5%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	1	0.1%
40.910	KERATOCONJUNCTIVITIS SICCA	2	0.0%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	3	0.2%
CORNEA					
70.210	PANNUS	2	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	3	0.0%	2	0.1%
70.700	CORNEAL DYSTROPHY	369	3.5%	58	3.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	6	0.1%	1	0.1%
UVEA					
93.110	IRIS HYPOPLASIA	2	0.0%	0	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	2	0.0%	0	0.0%
93.150	IRIS COLOBOMA	4	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	250	2.4%	66	3.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	13	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	31	0.3%	2	0.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	8	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	0.0%	8	0.5%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	10	0.1%	2	0.1%
FUNDUS					
97.120	COLOBOMA	1	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
120.960	RETINOPATHY	0	0.0%	1	0.1%
LENS					
100.200	CATARACT, UNSPECIFIED	23	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	569	5.4%	63	3.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	146	1.4%	37	2.1%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	95	0.9%	17	1.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	16	0.2%	8	0.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	11	0.1%	2	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	52	0.5%	15	0.9%
100.306	PUNCTATE CATARACT, NUCLEUS	19	0.2%	9	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR	27	0.3%	15	0.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	94	0.9%	7	0.4%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	226	2.1%	16	0.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	35	0.3%	8	0.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	48	0.5%	4	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	10	0.1%	3	0.2%

OCULAR DISORDERS REPORT
BICHON FRISE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 10,522 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,748 #	 %
LENS Continued				
100.317 INCIPIENT CATARACT, CAPSULAR	15	0.1%	6	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	3	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.0%	5	0.3%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	11	0.1%	35	2.0%
100.330 GENERALIZED/ COMPLETE CATARACT	149	1.4%	2	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***974***	***9.3%***	***158***	***9.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	26	0.2%	14	0.8%
110.135 PHPV/ PTVL	3	0.0%	1	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	11	0.1%	8	0.5%
110.320 VITREOUS DEGENERATION SYNERESIS	108	1.0%	24	1.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	70	0.7%	3	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	3	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	59	0.6%	1	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	3	0.0%	2	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	2	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	10	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	39	0.4%	0	0.0%
900.100 OTHER, NOT INHERITED	145	1.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	87	0.8%	82	4.7%
NORMAL				
.000 NORMAL GLOBE	8,609	81.8%	1,292	73.9%

Biewer Terrier

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	2	NO	Mutation in the *prcd* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
BIEWER TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 64 #	 %	2018-2022 336 #	 %
EYELIDS				
25.110 DISTICHIASIS	1	1.6%	12	3.6%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.6%
GLOBE				
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.3%
CORNEA				
70.700 CORNEAL DYSTROPHY	0	0.0%	2	0.6%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	9	14.1%	32	9.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	0	0.0%	1	0.3%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	3.1%	1	0.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	0	0.0%	1	0.3%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	1.6%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.6%
120.960 RETINOPATHY	0	0.0%	1	0.3%
130.110 MICROPAPILLA	0	0.0%	1	0.3%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	6.3%	3	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	4	6.3%	1	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	2	0.6%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	2	0.6%
100.317 INCIPIENT CATARACT, CAPSULAR	0	0.0%	1	0.3%
100.330 GENERALIZED/ COMPLETE CATARACT	1	1.6%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	1	1.6%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***6***	***9.4%***	***7***	***2.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	1.6%	1	0.3%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	1	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS	0	0.0%	2	0.6%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.6%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	1	1.6%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	1.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	6	1.8%
NORMAL				
.000 NORMAL GLOBE	52	81.3%	270	80.4%

BLACK AND TAN COONHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO
B.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BLACK AND TAN COONHOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	628		141	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.2%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	3	0.5%	1	0.7%
22.000	ECTROPION, UNSPECIFIED	7	1.1%	2	1.4%
25.110	DISTICHIASIS	6	1.0%	1	0.7%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	2	0.3%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.2%	0	0.0%
CORNEA					
70.210	PANNUS	2	0.3%	0	0.0%
70.700	CORNEAL DYSTROPHY	0	0.0%	1	0.7%
UVEA					
93.170	ANTERIOR CHAMBER CYST	1	0.2%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	5	0.8%	0	0.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.5%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	2	1.4%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	8	1.3%	2	1.4%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	1	0.2%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	1.4%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	47	7.5%	7	5.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	6	1.0%	1	0.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.2%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.3%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.2%	3	2.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.3%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	7	1.1%	4	2.8%
100.307	PUNCTATE CATARACT, CAPSULAR	4	0.6%	2	1.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.2%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	6	1.0%	2	1.4%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.3%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	4	0.6%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.2%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	1	0.2%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	3	0.5%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***41***	***6.5%***	***12***	***8.5%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.2%	0	0.0%
110.135	PHPV/ PTVL	1	0.2%	1	0.7%
110.320	VITREOUS DEGENERATION SYNERESIS	1	0.2%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	52	8.3%	20	14.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.2%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	2	0.3%	0	0.0%
900.100	OTHER, NOT INHERITED	11	1.8%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	1.3%	6	4.3%

OCULAR DISORDERS REPORT
BLACK AND TAN COONHOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	628		141	
Diagnostic Name		#	%	#	%
NORMAL					
.000	NORMAL GLOBE	476	75.8%	99	70.2%

BLACK RUSSIAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	2	NO	Mutation in the *prcd* gene
E.	POANV (polyneuropathy, ocular abnormalities neuronal vacuolation) - Microphthalmia - Cataracts - PPM (iris to iris)	Autosomal recessive	3	NO	Mutation in the *RAB3GAP1: c.743delC* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited. A DNA test is available.

E. POANV- Polyneuropathy with ocular abnormalities and neuronal vacuolation

An autosomal recessive condition resulting in juvenile polyneuropathy that presents as laryngeal paralysis and weakness. Patients have concurrent ophthalmic abnormalities including microphthalmia, incomplete cataracts (primarily nuclear) and iris-to-iris PPMs. Neuronal vacuolation was identified on histopathology. Affected dogs were found to be homozygous for the RAB3GAP1: c.743delC mutation. Patients with this variant are not reported to survive past 6 months.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

3. Mhlanga-Mutangadura T, Johnson GJ, Schnabel RD, et al. A mutation in the Warburg syndrome gene, RAB3GAP1, causes a similar syndrome with polyneuropathy and neuronal vacuolation in Black Russian Terrier dogs. Neurobiology of Disease. 2016;86:75-85. PMID: 26607784

OCULAR DISORDERS REPORT
BLACK RUSSIAN TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	688		343	
	Diagnostic Name	#	%	#	%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	8	1.2%	4	1.2%
22.000	ECTROPION, UNSPECIFIED	4	0.6%	1	0.3%
25.110	DISTICHIASIS	7	1.0%	4	1.2%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.1%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	2	0.3%	5	1.5%
UVEA					
93.110	IRIS HYPOPLASIA	1	0.1%	0	0.0%
93.120	IRIS CYST	4	0.6%	0	0.0%
93.150	IRIS COLOBOMA	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	15	2.2%	9	2.6%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.3%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	1	0.3%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.3%	4	1.2%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	1	0.3%
93.810	UVEAL MELANOMA	1	0.1%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	33	4.8%	24	7.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	15	2.2%	13	3.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	7	1.0%	2	0.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	2	0.6%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.3%	3	0.9%
100.306	PUNCTATE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	2	0.3%	7	2.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	5	0.7%	8	2.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	11	1.6%	5	1.5%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	1	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.1%	2	0.6%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.3%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	6	0.9%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	2	0.6%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	2	0.6%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***54***	***7.8%***	***46***	***13.4%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	2	0.6%
110.320	VITREOUS DEGENERATION SYNERESIS	2	0.3%	2	0.6%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	2	0.3%	1	0.3%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.3%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.3%
130.110	MICROPAPILLA	0	0.0%	2	0.6%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	2	0.6%
OPTIC NERVE					
130.110	MICROPAPILLA	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
BLACK RUSSIAN TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 688 #	 %	Year Examined: 2018-2022 Total # Dogs: 343 #	 %
OTHER				
900.000 OTHER, UNSPECIFIED	12	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED	8	1.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	10	1.5%	5	1.5%
NORMAL				
.000 NORMAL GLOBE	590	85.8%	265	77.3%

BLOODHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- iris to cornea	Not defined	1	NO
D.	Cataract	Not defined	1	NO
E.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comment

A. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except

in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BLOODHOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	601		91	
	Diagnostic Name	**#**	**%**	**#**	**%**
GLOBE					
.110	MICROPHTHALMIA	1	0.2%	1	1.1%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	1.1%
EYELIDS					
20.160	MACROPALPEBRAL FISSURE	75	12.5%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	132	22.0%	8	8.8%
22.000	ECTROPION, UNSPECIFIED	154	25.6%	11	12.1%
25.110	DISTICHIASIS	10	1.7%	1	1.1%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	3	0.5%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.2%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	6	1.0%	0	0.0%
CORNEA					
70.210	PANNUS	5	0.8%	0	0.0%
70.220	PIGMENTARY KERATITIS	3	0.5%	0	0.0%
70.700	CORNEAL DYSTROPHY	0	0.0%	1	1.1%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.3%	1	1.1%
UVEA					
93.120	IRIS CYST	0	0.0%	1	1.1%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	18	3.0%	6	6.6%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	5	0.8%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	38	6.3%	2	2.2%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	0.5%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.2%	0	0.0%
95.120	CILIARY BODY CYST	1	0.2%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	1	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	15	2.5%	4	4.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	10	1.7%	2	2.2%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.2%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	3	0.5%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.5%	2	2.2%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	16	2.7%	2	2.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	6	1.0%	1	1.1%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.5%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.2%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	4	0.7%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	5	0.8%	2	2.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.2%	2	2.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.3%	1	1.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	1.1%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.2%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.2%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***58***	***9.7%***	***13***	***14.3%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.2%	1	1.1%
110.135	PHPV/ PTVL	1	0.2%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	1	0.2%	0	0.0%

OCULAR DISORDERS REPORT
BLOODHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 601 #	 %	Year Examined: 2018-2022 Total # Dogs: 91 #	 %
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	33	5.5%	2	2.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.2%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.2%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	3	3.3%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	1	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	5	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	12	2.0%	1	1.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	12	2.0%	6	6.6%
NORMAL				
.000 NORMAL GLOBE	276	45.9%	47	51.6%

BLUE LACY

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BLUE LACY breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BLUE LACY

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4 #	 %	Year Examined: 2018-2022 Total # Dogs: 2 #	 %
NORMAL				
.000 NORMAL GLOBE	4	100.0%	2	100.0%

BLUE MOUNTAIN SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BLUE MOUNTAIN SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BLUE MOUNTAIN SHEPHERD

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		0	
Diagnostic Name		#	%	#	%
NORMAL					
.000	NORMAL GLOBE	1	100.0%	0	

BLUETICK COONHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BLUETICK COONHOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BLUETICK COONHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 29 #	 %	2018-2022 45 #	 %
EYELIDS				
22.000 ECTROPION, UNSPECIFIED	1	3.4%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	1	2.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	3.4%	1	2.2%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	3.4%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	6.9%	1	2.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	3.4%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	3	10.3%	0	0.0%
900.100 OTHER, NOT INHERITED	1	3.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	6.9%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	22	75.9%	42	93.3%

BOERBOEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Multifocal retinopathy	Autosomal recessive	2	NO (Breeder option with Normal DNA test for CMR)	Mutation in the *BEST1* gene
B.	Cataract	Not defined	1	NO	
C.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous sub-retinal fluid or accumulation of sub-retinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

OCULAR DISORDERS REPORT
BOERBOEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 44 #	 %	2018-2022 73 #	 %
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	1	2.3%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	0	0.0%	4	5.5%
22.000 ECTROPION, UNSPECIFIED	1	2.3%	0	0.0%
25.110 DISTICHIASIS	3	6.8%	1	1.4%
CORNEA				
70.220 PIGMENTARY KERATITIS	1	2.3%	0	0.0%
70.700 CORNEAL DYSTROPHY	0	0.0%	1	1.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	2.3%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	2.3%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	2.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	4.5%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	1.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	4.5%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	0	0.0%	1	1.4%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	3	4.1%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.5%	2	2.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	1.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	2.3%	1	1.4%
100.306 PUNCTATE CATARACT, NUCLEUS	1	2.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	1	1.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	1.4%
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	1.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.4%
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	1	1.4%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***2***	***4.5%***	***7***	***9.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	2	2.7%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	4.5%	3	4.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	2.3%	0	0.0%
120.960 RETINOPATHY	0	0.0%	1	1.4%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	2.3%	5	6.8%
NORMAL				
.000 NORMAL GLOBE	34	77.3%	50	68.5%

BOLOGNESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
B.	Retinal atrophy				
	- (*prcd)*	Autosomal recessive	2	NO	Mutation in the *prcd* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
BOLOGNESE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	786		66	
	Diagnostic Name	#	%	#	%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	3	0.4%	0	0.0%
25.110	DISTICHIASIS	108	13.7%	4	6.1%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.3%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	2	0.3%	0	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.3%	1	1.5%
CORNEA					
70.700	CORNEAL DYSTROPHY	14	1.8%	2	3.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	115	14.6%	15	22.7%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.8%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.5%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	19	2.4%	1	1.5%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	1.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	2	0.3%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	2	0.3%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	3	0.4%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	7	0.9%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.1%	1	1.5%
100.330	GENERALIZED/ COMPLETE CATARACT	4	0.5%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***22***	***2.8%***	***2***	***3.0%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	0	0.0%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	5	0.6%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	9	1.1%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	6	0.8%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.1%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	1	0.1%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	19	2.4%	0	0.0%
900.100	OTHER, NOT INHERITED	20	2.5%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	1.0%	1	1.5%
NORMAL					
.000	NORMAL GLOBE	572	72.8%	42	63.6%

BORDER COLLIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Y suture tip opacity	Not defined	1	Breeder option	
E.	Lens luxation	Not defined	2	NO	
F.	Retinal atrophy				
	- generalized	Suggested X-linked	3	NO	
G.	Choroidal hypoplasia (Collie Eye Anomaly) - optic Nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/coloboma	Autosomal recessive	1, 5-7	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

B. Persistent pupillary membranes (PPMs)

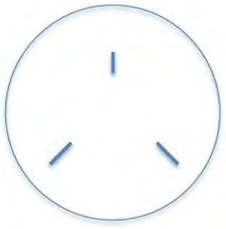
Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

E. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

G. Choroidal hypoplasia (Collie Eye Anomaly)
- Staphyloma/coloboma
- Retinal detachment
- Retinal hemorrhage
- Optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

Historical Note:

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Foster SJ, Curtis R, Barnett KC. Primary lens luxation in the Border Collie. J Small Anim Pract. 1986;27:1-6.

3. Vilboux T, Chaudieu G, Jeannin P, et al. Progressive retinal atrophy in the Border Collie: a new XLPRA. *BMC Vet Res*. 2008;4:10.

4. Bedford PG. Collie eye anomaly in the Border Collie. *Vet Rec*. 1982;111:34-35.

5. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Gen Res*. 2007;17:1562-1571.

6. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics*. 2003;82:86-95.

7. Marelli SP, Rizzi R, Paganelli A, Bagardi M, Minozzi G, Brambilla PG, Polli M. Genotypic and allelic frequency of a mutation in the *NHEJ1* gene associated with collie eye anomaly in dogs in Italy. Vet Rec Open. 2022 Jan 29;9(1):e26. doi: 10.1002/vro2.26. PMID: 35127102; PMCID: PMC8800487.

OCULAR DISORDERS REPORT
BORDER COLLIE

	Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 26,867 #	 %	Year Examined: 2018-2022 Total # Dogs: 3,051 #	 %
GLOBE					
.110	MICROPHTHALMIA	13	0.0%	1	0.0%
10.000	GLAUCOMA	1	0.0%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	2	0.0%	0	0.0%
25.110	DISTICHIASIS	126	0.5%	21	0.7%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	0	0.0%	1	0.0%
51.100	THIRD EYELID CARTILAGE ANOMALY	7	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	22	0.1%	4	0.1%
70.220	PIGMENTARY KERATITIS	1	0.0%	1	0.0%
70.700	CORNEAL DYSTROPHY	225	0.8%	41	1.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	5	0.0%	0	0.0%
UVEA					
90.250	PIGMENTARY UVEITIS	1	0.0%	0	0.0%
93.110	IRIS HYPOPLASIA	1	0.0%	3	0.1%
93.120	IRIS CYST	9	0.0%	1	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	2	0.0%	0	0.0%
93.150	IRIS COLOBOMA	8	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1,693	6.3%	207	6.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	34	0.1%	5	0.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	34	0.1%	1	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	15	0.1%	1	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	11	0.0%	15	0.5%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.0%	3	0.1%
93.810	UVEAL MELANOMA	1	0.0%	2	0.1%
95.120	CILIARY BODY CYST	2	0.0%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	3	0.0%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	441	1.6%	35	1.1%
97.120	COLOBOMA	48	0.2%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	3	0.1%
130.110	MICROPAPILLA	0	0.0%	2	0.1%
LENS					
100.200	CATARACT, UNSPECIFIED	57	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,272	4.7%	173	5.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	164	0.6%	47	1.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	84	0.3%	12	0.4%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	59	0.2%	18	0.6%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	9	0.0%	4	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	220	0.8%	62	2.0%
100.306	PUNCTATE CATARACT, NUCLEUS	46	0.2%	21	0.7%
100.307	PUNCTATE CATARACT, CAPSULAR	63	0.2%	31	1.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	151	0.6%	12	0.4%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	112	0.4%	12	0.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	131	0.5%	24	0.8%

OCULAR DISORDERS REPORT
BORDER COLLIE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 26,867 #	 %	Year Examined: 2018-2022 Total # Dogs: 3,051 #	 %
LENS Continued				
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	14	0.1%	1	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	67	0.2%	25	0.8%
100.316 INCIPIENT CATARACT, NUCLEUS	32	0.1%	15	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	33	0.1%	10	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	6	0.0%	9	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.0%	9	0.3%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	4	0.0%	2	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	1	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	4	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	2	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	80	0.3%	120	3.9%
100.330 GENERALIZED/ COMPLETE CATARACT	29	0.1%	1	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	14	0.1%	1	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,288***	***4.8%***	***321***	***10.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	67	0.2%	6	0.2%
110.135 PHPV/ PTVL	20	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	16	0.1%	3	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	159	0.6%	24	0.8%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	199	0.7%	14	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	16	0.1%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	233	0.9%	11	0.4%
120.400 RETINAL HEMORRHAGE	6	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	18	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
120.960 RETINOPATHY	21	0.1%	2	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	22	0.1%	1	0.0%
130.120 OPTIC NERVE HYPOPLASIA	19	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	96	0.4%	1	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	214	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	607	2.3%	2	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	286	1.1%	169	5.5%
NORMAL				
.000 NORMAL GLOBE	22,324	83.1%	2,208	72.4%

BORDER TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Y suture tip opacity	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.

These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either

be breeder option or failing.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BORDER TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 6,594 #	%	2018-2022 1,583 #	%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	3	0.0%	0	0.0%
25.110 DISTICHIASIS	47	0.7%	19	1.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.1%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	0	0.0%	1	0.1%
70.700 CORNEAL DYSTROPHY	14	0.2%	2	0.1%
UVEA				
93.120 IRIS CYST	1	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	187	2.8%	64	4.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.0%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.0%	2	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
97.120 COLOBOMA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.1%
130.110 MICROPAPILLA	0	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	9	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	433	6.6%	119	7.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	80	1.2%	45	2.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	36	0.5%	13	0.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	34	0.5%	9	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	8	0.1%	3	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	96	1.5%	46	2.9%
100.306 PUNCTATE CATARACT, NUCLEUS	10	0.2%	6	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	30	0.5%	21	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	74	1.1%	24	1.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	61	0.9%	11	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	84	1.3%	15	0.9%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.0%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	21	0.3%	4	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	14	0.2%	3	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	10	0.2%	6	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	6	0.1%	5	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	8	0.1%	4	0.3%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	3	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	1	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	66	1.0%	102	6.4%
100.330 GENERALIZED/ COMPLETE CATARACT	21	0.3%	1	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	3	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***613***	***9.3%***	***221***	***14.0%***

OCULAR DISORDERS REPORT
BORDER TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 6,594 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,583 #	 %
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	8	0.1%	5	0.3%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	16	0.2%	5	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS	58	0.9%	7	0.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	14	0.2%	3	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	8	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	12	0.2%	1	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	0	0.0%	5	0.3%
OPTIC NERVE				
130.110 MICROPAPILLA	0	0.0%	1	0.1%
130.120 OPTIC NERVE HYPOPLASIA	1	0.0%	1	0.1%
OTHER				
900.000 OTHER, UNSPECIFIED	56	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	130	2.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	92	1.4%	57	3.6%
NORMAL				
.000 NORMAL GLOBE	5,742	87.1%	1,202	75.9%

BORZOI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Retinopathy	Not defined	1, 2	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinopathy

Patchy focal unilateral or bilateral hyper reflective tapetal lesions most frequently peripheral but occasionally central around a pigmented spot, usually non progressive. Not usually present prior to 3 months of age but usually present by 18 months of age.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Storey ES, Grahn BH and Alcorn J. Multifocal chorioretinal lesions in Borzoi dogs. *Vet Ophthalmol*. 2005 Sep-Oct;8:337-347. PMID: 16178845

OCULAR DISORDERS REPORT
BORZOI

Diagnostic Name	1993-2017 #	1993-2017 %	2018-2022 #	2018-2022 %
	Year Examined:	**1993-2017**	**2018-2022**	
	Total # Dogs:	**3,668**	**1,065**	
GLOBE				
.110 MICROPHTHALMIA	7	0.2%	1	0.1%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
25.110 DISTICHIASIS	9	0.2%	2	0.2%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	0	0.0%	3	0.3%
51.100 THIRD EYELID CARTILAGE ANOMALY	2	0.1%	2	0.2%
CORNEA				
70.210 PANNUS	17	0.5%	7	0.7%
70.220 PIGMENTARY KERATITIS	1	0.0%	1	0.1%
70.700 CORNEAL DYSTROPHY	16	0.4%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA				
93.120 IRIS CYST	7	0.2%	1	0.1%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	2	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	76	2.1%	17	1.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	6	0.2%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	11	0.3%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.1%	2	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.1%	0	0.0%
93.810 UVEAL MELANOMA	2	0.1%	4	0.4%
95.120 CILIARY BODY CYST	1	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	113	3.1%	28	2.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	13	0.4%	3	0.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	14	0.4%	1	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.0%	2	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	15	0.4%	3	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS	2	0.1%	3	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR	9	0.2%	17	1.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	13	0.4%	3	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	19	0.5%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.2%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	3	0.1%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	10	0.3%	2	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	2	0.2%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	7	0.2%	5	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT	8	0.2%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***124***	***3.4%***	***38***	***3.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	13	0.4%	1	0.1%

OCULAR DISORDERS REPORT
BORZOI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,668 #	 %	2018-2022 1,065 #	 %
VITREOUS Continued				
110.135 PHPV/ PTVL	11	0.3%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.1%	3	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS	9	0.2%	3	0.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	8	0.2%	2	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	8	0.2%	2	0.2%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	27	0.7%	1	0.1%
120.400 RETINAL HEMORRHAGE	2	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	5	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.1%	0	0.0%
120.960 RETINOPATHY	30	0.8%	12	1.1%
FUNDUS				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	3	0.3%
120.960 RETINOPATHY	0	0.0%	13	1.2%
120.970 CMR/ CMR-LIKE RETINOPATHY	0	0.0%	3	0.3%
OPTIC NERVE				
130.110 MICROPAPILLA	13	0.4%	5	0.5%
130.120 OPTIC NERVE HYPOPLASIA	16	0.4%	0	0.0%
130.150 OPTIC DISC COLOBOMA	4	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	44	1.2%	0	0.0%
900.100 OTHER, NOT INHERITED	109	3.0%	3	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	92	2.5%	82	7.7%
NORMAL				
.000 NORMAL GLOBE	3,169	86.4%	872	81.9%

BOSTON TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	2,3	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
D.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
	- endothelial	Not defined	4	NO	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
F.	Cataract				
	- generalized	Not defined	1, 5, 6	NO	
	- *HSF4*	Autosomal recessive	6-7	NO	Mutation in the *HSF4* gene (*HSF4-1*)
G.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine screening exam for certification.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

D. Corneal dystrophy

- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

- endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

In the Boston Terrier, this is a primary degenerative endothelial disease leading to progressive and permanent corneal edema. It is not known if this disease is an inherited disorder. There is no sex predilection. The condition is observed in older dogs, 6 to 13 years of age with a mean of 9.5 years. The corneal edema starts asymptomatically in the dorsal temporal corneal quadrant of one eye and slowly progresses medially, eventually involving the entire cornea. Typically, it becomes bilateral. In the later stages, discomfort, intracorneal bullae with subsequent ulceration and keratoconus may develop.

F. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally during the first three months of life. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

- generalized

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

- HSF4

The Boston Terrier has at least two distinct forms of inherited cataract. One type has an onset before 6 months of age with rapid progression to complete opacity prior to 2 years old. The early onset cataract is inherited as an autosomal recessive mutation in the *HSF4* gene (*HSF4-1*). A DNA test is available. A second type of cataract occurs after 4-5 years of age with variable progression. The genetic mutation responsible for this cataract is not yet known.

H. Vitreous degeneration - syneresis

Liquefaction of the vitreous gel which may predispose to retinal detachment.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Slater MR, Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc*. 1986;188:1028-1030.

3. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111.

4. Martin CL, Dice PF. Corneal Endothelial Dystrophy in the Dog. *J Am Anim Hosp Assoc*. 1982;18:327-336.

5. Curtis R. Late-onset cataract in the Boston terrier. *Vet Rec*. 1984;115:577-578.

6. Mellersh CS, Graves KT, McLaughlin B, et al. Mutation in HSF4 associated with early but not late-onset hereditary cataract in the Boston Terrier. *J Hered*. 2007;98:531-533.

7. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol*. 2006;9:369-378.

OCULAR DISORDERS REPORT
BOSTON TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	15,000		4,137	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	2	0.0%	3	0.1%
10.000	GLAUCOMA	1	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	5	0.0%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	12	0.1%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	44	0.3%	14	0.3%
22.000	ECTROPION, UNSPECIFIED	2	0.0%	0	0.0%
25.110	DISTICHIASIS	521	3.5%	114	2.8%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	47	1.1%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	52	0.3%	45	1.1%
40.910	KERATOCONJUNCTIVITIS SICCA	13	0.1%	1	0.0%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	2	0.0%	2	0.0%
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	11	0.1%	3	0.1%
CORNEA					
70.210	PANNUS	1	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	21	0.1%	7	0.2%
70.700	CORNEAL DYSTROPHY	349	2.3%	90	2.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	27	0.2%	6	0.1%
UVEA					
93.110	IRIS HYPOPLASIA	6	0.0%	2	0.0%
93.120	IRIS CYST	25	0.2%	2	0.0%
93.150	IRIS COLOBOMA	8	0.1%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	6	0.0%	3	0.1%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	570	3.8%	160	3.9%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	14	0.1%	2	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	7	0.0%	2	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	8	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.0%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	0	0.0%	2	0.0%
93.810	UVEAL MELANOMA	1	0.0%	0	0.0%
95.120	CILIARY BODY CYST	4	0.0%	7	0.2%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	2	0.0%	3	0.1%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.0%
120.960	RETINOPATHY	0	0.0%	1	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	81	0.5%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	345	2.3%	72	1.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	214	1.4%	52	1.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	56	0.4%	14	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	89	0.6%	24	0.6%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	49	0.3%	14	0.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	33	0.2%	7	0.2%
100.306	PUNCTATE CATARACT, NUCLEUS	17	0.1%	2	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	45	0.3%	20	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	695	4.6%	130	3.1%

OCULAR DISORDERS REPORT
BOSTON TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 15,000 #	 %	Year Examined: 2018-2022 Total # Dogs: 4,137 #	 %
LENS Continued				
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	165	1.1%	27	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	311	2.1%	48	1.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	92	0.6%	8	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	38	0.3%	3	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	22	0.1%	3	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	20	0.1%	1	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	47	0.3%	57	1.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	18	0.1%	20	0.5%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	20	0.1%	10	0.2%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	3	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	2	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.0%
100.328 Y-SUTURE TIP OPACITIES	15	0.1%	7	0.2%
100.330 GENERALIZED/ COMPLETE CATARACT	99	0.7%	5	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	1	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	16	0.1%	2	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***2,117***	***14.1%***	***449***	***10.9%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	51	0.3%	27	0.7%
110.135 PHPV/ PTVL	9	0.1%	4	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	46	0.3%	5	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	152	1.0%	25	0.6%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	36	0.2%	3	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	12	0.1%	5	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	4	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	11	0.1%	0	0.0%
120.400 RETINAL HEMORRHAGE	3	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	0	0.0%
120.960 RETINOPATHY	4	0.0%	1	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	2	0.0%	1	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	165	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	380	2.5%	4	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	256	1.7%	205	5.0%
NORMAL				
.000 NORMAL GLOBE	12,010	80.1%	3,205	77.5%

BOUVIER DES FLANDRES

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2-3	NO
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO
D.	Y-suture tip opacity	Not defined	1	Breeder option
E.	Persistent hyperplastic primary vitreous / Persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Not defined	4	NO

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine screening exam for certification.

In this breed, primary glaucoma is associated with narrowed iridocorneal angles and various degrees of congenital angle malformations varying from mild to severe. Dysplastic pectinate ligaments and subsequent narrowed angles are similar to those described in the Basset Hound and American and English Cocker Spaniels. The occurrence of glaucoma is related to the most severe abnormalities of the pectinate ligaments. The relationship between glaucoma development and the anomaly of the pectinate ligament is not clear.

A recent study evaluated risk factors for development of glaucoma in the Bouvier des Flandres. A narrow angle with dysplastic pectinate ligaments on gonioscopy and/or presence of a narrow or closed ciliary cleft on high resolution ultrasound were associated with development of primary glaucoma in the breed.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

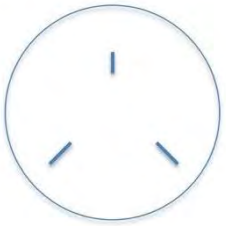
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

E. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

In the Bouvier des Flandres, the condition is associated with retinal dysplasia and detachment, optic nerve hypoplasia, lenticonus, cataract and congenital blindness.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. van der Linde-Sipman JS. Dysplasia of the pectinate ligament and primary glaucoma in the Bouvier

des Flandres dog. *Vet Pathol*. 1987;24:201-206. PMID: 3603960

3. Dubin AJ, Bentley E, Buhr KA, et al. Evaluation of potential risk factors for primary angle-closure glaucoma in Bouvier des Flandres. *J Am Vet Med Assoc.* 2017;250: 60-67. PMID: 28001106

4. Van Rensburg IBJ, Petrick S, Van der Lagt J, et al. Multiple inherited eye anomalies including persistent hyperplastic tunica vasculosa lentis in the Bouvier des Flanders. *Prog Vet Comp Ophthal.* 1992;2: 193

OCULAR DISORDERS REPORT
BOUVIER DES FLANDRES

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 5,404 #	%	2018-2022 784 #	%
GLOBE				
10.000 GLAUCOMA	1	0.0%	1	0.1%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	30	0.6%	4	0.5%
22.000 ECTROPION, UNSPECIFIED	6	0.1%	0	0.0%
25.110 DISTICHIASIS	45	0.8%	4	0.5%
CORNEA				
70.210 PANNUS	1	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	33	0.6%	4	0.5%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	4	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	15	0.3%	4	0.5%
93.170 ANTERIOR CHAMBER CYST	2	0.0%	1	0.1%
93.180 IIRIS SPHINCTER DYSPLASIA	1	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	454	8.4%	73	9.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	11	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	7	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	8	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	22	0.4%	14	1.8%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.0%	0	0.0%
93.810 UVEAL MELANOMA	1	0.0%	0	0.0%
95.120 CILIARY BODY CYST	1	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	5	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	461	8.5%	87	11.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	67	1.2%	31	4.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	47	0.9%	6	0.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.1%	4	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	13	0.2%	3	0.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	65	1.2%	20	2.6%
100.306 PUNCTATE CATARACT, NUCLEUS	22	0.4%	11	1.4%
100.307 PUNCTATE CATARACT, CAPSULAR	36	0.7%	19	2.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	20	0.4%	6	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	109	2.0%	9	1.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	24	0.4%	5	0.6%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	26	0.5%	5	0.6%
100.316 INCIPIENT CATARACT, NUCLEUS	39	0.7%	4	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	17	0.3%	6	0.8%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.1%	5	0.6%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.1%	3	0.4%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	2	0.0%	2	0.3%
100.328 Y-SUTURE TIP OPACITIES	39	0.7%	64	8.2%
100.330 GENERALIZED/ COMPLETE CATARACT	31	0.6%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***536***	***9.9%***	***141***	***18.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	11	0.2%	4	0.5%
110.135 PHPV/ PTVL	6	0.1%	0	0.0%

OCULAR DISORDERS REPORT
BOUVIER DES FLANDRES

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 5,404 #	 %	2018-2022 784 #	 %
VITREOUS Continued				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	1	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	10	0.2%	2	0.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	35	0.6%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	3	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	14	0.3%	0	0.0%
120.960 RETINOPATHY	1	0.0%	0	0.0%
FUNDUS				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	3	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	3	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	64	1.2%	0	0.0%
900.100 OTHER, NOT INHERITED	136	2.5%	2	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	160	3.0%	42	5.4%
NORMAL				
.000 NORMAL GLOBE	4,163	77.0%	511	65.2%

BOXER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1, 2	Breeder option	
B.	Ectropion	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Spontaneous chronic corneal epithelial defect (SCCED)	Not defined	3-6	Breeder option**	Mutation in the *NOG* gene
E.	Cataract	Not defined	1	NO	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

In the Boxer, because there is significant clinical disease associated with the abnormal hairs, breeding affected animals should be discouraged.

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Corneal dystrophy - epithelial erosion

A general group of corneal ulcerative conditions (e.g. erosions, indolent or persistent ulcers, epithelial bonding defects) is recognized as a common problem in older Boxers (as well as other older animals). It has been commonly referred to as Boxer corneal ulceration. Animals that are affected are usually 7-8 years

of age or older. The ulceration can be a very difficult lesion to heal, and it is often recurrent. The chronic form stimulates eventual scarring, with vascularization, fibrosis and pigmentation of the lesion site. The lesion can cause vision impairment. A genetic mutation in the NOG gene has been identified as related to this condition in Boxers. **Although this current recommendation is breeder option, if further studied and heritability defined, this recommendation could be modified**

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. "Epidemiology and Clinical Significance of Canine Distichiasis: A Retrospective Study of 291 Cases" Abstracts: Annual Scientific Meeting of the European College of Veterinary Ophthalmologists, Online, May 20-23, 2021. Vet Ophthalmol. 2022 Mar;25(2):e1-e43. doi: 10.1111/vop.12979. Epub 2022 Mar 14. PMID: 35285574.

3. Roberts SR. Superficial indolent ulcer in the cornea of Boxer dogs. *J Small Anim Pract.* 1965;6:111.

4. Gelatt KN and Samuelson DA. Recurrent corneal erosions and epithelial dystrophy in the Boxer dog. *J Am Anim Hosp Assoc*. 1982;18:453.

5. Kirschner SE, Niyo Y and Betts DM. Idiopathic persistent corneal erosions: clinical and pathological findings in 18 dogs. *J Am Anim Hosp Assoc*. 1989;25:84.

6. Meurs KM, Montgomery K, Friedenberg SG, Williams B, Gilger BC. A defect in the NOG gene increases susceptibility to spontaneous superficial chronic corneal epithelial defects (SCCED) in boxer dogs. BMC Vet Res. 2021 Jul 26;17(1):254. doi: 10.1186/s12917-021-02955-1. PMID: 34311726; PMCID: PMC8314488.

OCULAR DISORDERS REPORT
BOXER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,809		208	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	5	0.3%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	3	0.2%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	9	0.5%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	7	0.4%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	69	3.8%	3	1.4%
25.110	DISTICHIASIS	217	12.0%	18	8.7%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.5%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.1%	0	0.0%
CORNEA					
70.210	PANNUS	1	0.1%	0	0.0%
70.220	PIGMENTARY KERATITIS	1	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	149	8.2%	18	8.7%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	3	0.2%	0	0.0%
UVEA					
93.120	IRIS CYST	1	0.1%	1	0.5%
93.150	IRIS COLOBOMA	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	4	0.2%	0	0.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.2%	1	0.5%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	11	0.6%	2	1.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	0.3%	2	1.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.3%	1	0.5%
LENS					
100.200	CATARACT, UNSPECIFIED	4	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	47	2.6%	7	3.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	3	0.2%	1	0.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.2%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.2%	1	0.5%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.2%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.1%	1	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.2%	2	1.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	18	1.0%	5	2.4%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	2	0.1%	2	1.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.4%	1	0.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.1%	1	0.5%
100.316	INCIPIENT CATARACT, NUCLEUS	4	0.2%	1	0.5%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.1%	1	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.1%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	3	0.2%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	7	0.4%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***71***	***3.9%***	***16***	***7.7%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	3	0.2%	0	0.0%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	1	0.5%

OCULAR DISORDERS REPORT
BOXER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,809 #	 %	Year Examined: 2018-2022 Total # Dogs: 208 #	 %
VITREOUS Continued				
110.320 VITREOUS DEGENERATION SYNERESIS	11	0.6%	1	0.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	5	0.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	1	0.5%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.2%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	1	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	3	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	13	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	44	2.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	26	1.4%	12	5.8%
NORMAL				
.000 NORMAL GLOBE	1,317	72.8%	145	69.7%

BOYKIN SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E	Y suture tip opacity	Not defined	1	Breeder option	
F.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
H.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Autosomal recessive	1, 2	NO	Mutation in the *NHEJ1 gene*

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

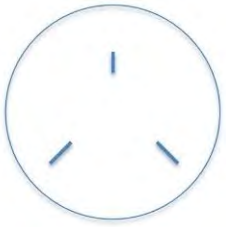
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

F. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

H. Choroidal hypoplasia (Collie Eye Anomaly)
- Staphyloma/coloboma
- Retinal detachment

- Retinal hemorrhage
- Optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. ACVO Genetics Committee, 1999 and/or Data from OFA All-Breeds Report, 1991-1998.

2. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res*. 2007 Nov;17:1562-1571. PMID: 17916641 PMCID: PMC2045139

OCULAR DISORDERS REPORT
BOYKIN SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4,107 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,746 #	 %
GLOBE				
.110 MICROPHTHALMIA	1	0.0%	1	0.1%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	2	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	1	0.0%	1	0.1%
25.110 DISTICHIASIS	550	13.4%	236	13.5%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	2	0.1%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	2	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	1	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	4	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY	54	1.3%	25	1.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	4	0.1%	2	0.1%
93.120 IRIS CYST	1	0.0%	2	0.1%
93.150 IRIS COLOBOMA	1	0.0%	0	0.0%
93.180 IRIS SPHINCTER DYSPLASIA	0	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	118	2.9%	30	1.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.0%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.1%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	18	0.4%	35	2.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	0	0.0%	2	0.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	2	0.0%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	52	1.3%	6	0.3%
97.120 COLOBOMA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	8	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	4	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
120.960 RETINOPATHY	0	0.0%	3	0.2%
130.150 OPTIC DISC COLOBOMA	0	0.0%	3	0.2%
LENS				
100.200 CATARACT, UNSPECIFIED	7	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	246	6.0%	155	8.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	53	1.3%	67	3.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	54	1.3%	16	0.9%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	8	0.2%	4	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	12	0.3%	1	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	30	0.7%	16	0.9%
100.306 PUNCTATE CATARACT, NUCLEUS	29	0.7%	38	2.2%
100.307 PUNCTATE CATARACT, CAPSULAR	45	1.1%	51	2.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	20	0.5%	11	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	54	1.3%	40	2.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	8	0.2%	8	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%

OCULAR DISORDERS REPORT
BOYKIN SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4,107 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,746 #	 %
LENS Continued				
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	8	0.2%	6	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	13	0.3%	9	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	15	0.4%	21	1.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	3	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.1%	1	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	15	0.4%	19	1.1%
100.330 GENERALIZED/ COMPLETE CATARACT	11	0.3%	1	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***376***	***9.2%***	***297***	***17.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	42	1.0%	34	1.9%
110.135 PHPV/ PTVL	5	0.1%	4	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS	9	0.2%	2	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	72	1.8%	9	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	9	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	31	0.8%	2	0.1%
120.400 RETINAL HEMORRHAGE	2	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	2	0.1%
120.960 RETINOPATHY	14	0.3%	2	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	4	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	32	0.8%	6	0.3%
OTHER				
900.000 OTHER, UNSPECIFIED	73	1.8%	0	0.0%
900.100 OTHER, NOT INHERITED	86	2.1%	4	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	88	2.1%	102	5.8%
NORMAL				
.000 NORMAL GLOBE	3,005	73.2%	1,115	63.9%

BOZ SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BOZ SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BOZ SHEPHERD

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		0	
Diagnostic Name		#	%	#	%
NORMAL					
.000	NORMAL GLOBE	1	100.0%	0	

BRACCO ITALIANO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BRACCO ITALIANO

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	149		108	
	Diagnostic Name	#	%	#	%
EYELIDS					
20.160	MACROPALPEBRAL FISSURE	1	0.7%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	7	4.7%	9	8.3%
25.110	DISTICHIASIS	14	9.4%	10	9.3%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	2	1.3%	1	0.9%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.7%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	1.3%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	2	1.9%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	10	6.7%	5	4.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	3	2.0%	1	0.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	4	2.7%	2	1.9%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.7%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	2	1.3%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	0	0.0%	2	1.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	2	1.3%	1	0.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	9	6.0%	3	2.8%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	4	2.7%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.9%
100.316	INCIPIENT CATARACT, NUCLEUS	2	1.3%	2	1.9%
100.317	INCIPIENT CATARACT, CAPSULAR	2	1.3%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	2	1.3%	2	1.9%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***29***	***19.5%***	***12***	***11.1%***
VITREOUS					
110.135	PHPV/ PTVL	2	1.3%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	2	1.3%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	8	5.4%	2	1.9%
120.960	RETINOPATHY	2	1.3%	0	0.0%
FUNDUS					
120.960	RETINOPATHY	0	0.0%	1	0.9%
OTHER					
900.000	OTHER, UNSPECIFIED	2	1.3%	0	0.0%
900.100	OTHER, NOT INHERITED	3	2.0%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	2.0%	4	3.7%
NORMAL					
.000	NORMAL GLOBE	95	63.8%	74	68.5%

BRAQUE D’AUVERGNE

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BRAQUE D’AUVERGNE breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BRAQUE D'AUVERGNE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	35		15	
	Diagnostic Name	**#**	**%**	**#**	**%**
GLOBE					
.110	MICROPHTHALMIA	1	2.9%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	0	0.0%	1	6.7%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	4	11.4%	2	13.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	2.9%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	2.9%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	6	17.1%	1	6.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	3	8.6%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	6.7%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	5.7%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	2	5.7%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1	2.9%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	2	5.7%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***10***	***28.6%***	***1***	***6.7%***
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	1	2.9%	0	0.0%
OTHER					
900.100	OTHER, NOT INHERITED	1	2.9%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	5.7%	4	26.7%
NORMAL					
.000	NORMAL GLOBE	20	57.1%	9	60.0%

BRAQUE DU BOURBONNAIS

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BRAQUE DU BOURBONNAIS breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BRAQUE DU BOURBONNAIS

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	6		6	
	Diagnostic Name	**#**	**%**	**#**	**%**
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	1	16.7%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	16.7%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	16.7%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***0***	***0.0%***	***1***	***16.7%***
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	16.7%
NORMAL					
.000	NORMAL GLOBE	6	100.0%	3	50.0%

BRAQUE FRANCAIS

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BRAQUE FRANCAIS

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	53		68	
	Diagnostic Name	#	%	#	%
EYELIDS					
25.110	DISTICHIASIS	2	3.8%	2	2.9%
UVEA					
93.120	IRIS CYST	0	0.0%	1	1.5%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	2	2.9%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	1.9%	3	4.4%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	9.4%	3	4.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	1.9%	2	2.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	1.5%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	1.5%
100.307	PUNCTATE CATARACT, CAPSULAR	1	1.9%	2	2.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1	1.9%	1	1.5%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	1.5%
100.317	INCIPIENT CATARACT, CAPSULAR	2	3.8%	1	1.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.5%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	1.9%	2	2.9%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	1.5%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	2	2.9%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***6***	***11.3%***	***16***	***23.5%***
VITREOUS					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	1	1.5%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	1.5%
OTHER					
900.100	OTHER, SUSPECT INHERITED	0	0.0%	2	2.9%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	7.5%	6	8.8%
NORMAL					
.000	NORMAL GLOBE	42	79.2%	43	63.2%

BRAQUE FRANCAIS PYRENEES

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BRAQUE FRANCAIS PYRENEES breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BRAQUE FRANCAIS PYRENEES

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	5		22	
	Diagnostic Name	**#**	**%**	**#**	**%**
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	2	9.1%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	4.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	1	4.5%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	4.5%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***0***	***0.0%***	***2***	***9.1%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	1	4.5%
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	4.5%
NORMAL					
.000	NORMAL GLOBE	4	80.0%	17	77.3%

BRAZILIAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Multifocal retinopathy - *cmr1*	Autosomal recessive	1	NO (Breeder option with Normal DNA test for CMR)	Mutation in the *BEST1* gene

Description and Comments

A. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Brazilian Terrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

OCULAR DISORDERS REPORT
BRAZILIAN TERRIER

There are no statistics available for this breed

BRIARD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Not defined	1	NO	
D.	Retinal dystrophy formerly Congenital stationary night blindness (*CSNB*)	Autosomal recessive	2	NO	Mutation in the *RPE65* gene

Description and Comments

A. Corneal dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Retinal dystrophy formerly Congenital stationary night blindness (*CSNB*)

A non-progressive retinal function defect characterized primarily by night blindness; day vision is normal to severely compromised. CSNB is an autosomal recessive trait caused by a mutation in the RPE65 gene.

The condition is detected by 5-6 weeks of age, after the postnatal maturation of the retina is completed. Nystagmus is present in some dogs, particularly in those having night blindness and severely compromised day vision. Ophthalmoscopic examination shows no abnormalities. Abnormalities in serum lipids (mild hypercholesterolemia) and elevated arachidonic acid have been noted in some animals. The ERG results are specific and diagnostic for the disorder. ERG testing is essential to distinguish this disorder from more central visual pathway defects which may appear clinically similar.

The gene mutation RPE65 has been identified. This is the same mutation as causes Leber's congenital amaurosis, also sometimes called juvenile retinitis pigmentosa (RP), in humans. A DNA test is available.

Historical Note:

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Veske A, Nilsson SE, Narfström K, Gal A. Retinal dystrophy of Swedish briard/briard-beagle dogs is due to a 4-bp deletion in RPE65. Genomics. 1999 Apr 1;57(1):57-61. doi: 10.1006/geno.1999.5754. PMID: 10191083.

OCULAR DISORDERS REPORT
BRIARD

Diagnostic Name	1993-2017 # (Total # Dogs: 2,309)	1993-2017 %	2018-2022 # (Total # Dogs: 214)	2018-2022 %
GLOBE				
10.000 GLAUCOMA	1	0.0%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110 DISTICHIASIS	9	0.4%	5	2.3%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.1%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	2	0.1%	2	0.9%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	2	0.1%	0	0.0%
CORNEA				
70.210 PANNUS	1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	32	1.4%	7	3.3%
UVEA				
93.120 IRIS CYST	10	0.4%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	26	1.1%	6	2.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.1%	1	0.5%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	9	0.4%	6	2.8%
FUNDUS				
97.120 COLOBOMA	1	0.0%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.5%
LENS				
100.200 CATARACT, UNSPECIFIED	9	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	74	3.2%	9	4.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	8	0.3%	1	0.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.1%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	5	0.2%	2	0.9%
100.306 PUNCTATE CATARACT, NUCLEUS	6	0.3%	1	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR	5	0.2%	8	3.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	6	0.3%	1	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	9	0.4%	2	0.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	7	0.3%	2	0.9%
100.317 INCIPIENT CATARACT, CAPSULAR	3	0.1%	2	0.9%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	3	0.1%	1	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT	3	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***70***	***3.0%***	***20***	***9.3%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.0%	2	0.9%
110.135 PHPV/ PTVL	3	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	2	0.1%	1	0.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	7	0.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.0%	0	0.0%

OCULAR DISORDERS REPORT
BRIARD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,309 #	 %	Year Examined: 2018-2022 Total # Dogs: 214 #	 %
RETINA Continued				
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	3	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	37	1.6%	0	0.0%
900.100 OTHER, NOT INHERITED	58	2.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	35	1.5%	11	5.1%
NORMAL				
.000 NORMAL GLOBE	2,108	91.3%	169	79.0%

BRITTANY

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membrane			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membrane (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The exact frequency and significance of cataracts in the Brittany is not known, although it is probably low.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
BRITTANY

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2,587		886	
	Diagnostic Name	#	%	#	%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	0	0.0%	1	0.1%
25.110	DISTICHIASIS	61	2.4%	10	1.1%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	5	0.2%	2	0.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	3	0.1%	0	0.0%
UVEA					
93.120	IRIS CYST	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	0	0.0%	1	0.1%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	41	1.6%	9	1.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	16	0.6%	22	2.5%
LENS					
100.200	CATARACT, UNSPECIFIED	10	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	120	4.6%	38	4.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	25	1.0%	20	2.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	34	1.3%	13	1.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.2%	1	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	12	0.5%	2	0.2%
100.306	PUNCTATE CATARACT, NUCLEUS	9	0.3%	6	0.7%
100.307	PUNCTATE CATARACT, CAPSULAR	19	0.7%	14	1.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	14	0.5%	6	0.7%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	44	1.7%	13	1.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	13	0.5%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	9	0.3%	3	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	8	0.3%	3	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	6	0.2%	4	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.1%	2	0.2%
100.328	Y-SUTURE TIP OPACITIES	3	0.1%	3	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	4	0.2%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.2%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***223***	***8.6%***	***88***	***9.9%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	6	0.2%	6	0.7%
110.135	PHPV/ PTVL	1	0.0%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	3	0.3%
110.320	VITREOUS DEGENERATION SYNERESIS	16	0.6%	4	0.5%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	8	0.3%	2	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	7	0.3%	2	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	21	0.8%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%

OCULAR DISORDERS REPORT
BRITTANY

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,587 #	 %	Year Examined: 2018-2022 Total # Dogs: 886 #	 %
RETINA Continued				
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	2	0.1%	1	0.1%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	17	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	62	2.4%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	34	1.3%	53	6.0%
NORMAL				
.000 NORMAL GLOBE	2,209	85.4%	710	80.1%

BRUSSELS GRIFFON

	DISORDER	INHERITANCE	REFERENCES	BREEDING ADVICE
A.	Exposure keratopathy syndrome	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Vitreous degeneration			
	- anterior chamber	Not defined	1, 2	Breeder option
	- syneresis	Not defined	1, 2	Breeder option
F.	Retinal atrophy			
	- generalized	Not defined	1	NO
G.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
	- geographic	Not defined	1	NO

Description and Comments

A. Exposure keratopathy syndrome

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

G. Retinal dysplasia

- folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

- geographic

An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Krishnan, H., et al. (2020). "Vitreous degeneration and associated ocular abnormalities in the dog." Vet Ophthalmol 23(2): 219-224. PMID: 31464365.

OCULAR DISORDERS REPORT
BRUSSELS GRIFFON

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,486 #	%	2018-2022 393 #	%
EYELIDS				
20.140 ECTOPIC CILIA	8	0.5%	2	0.5%
21.000 ENTROPION, UNSPECIFIED	6	0.4%	0	0.0%
25.110 DISTICHIASIS	34	2.3%	11	2.8%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	3	0.2%	0	0.0%
CORNEA				
70.210 PANNUS	1	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS	26	1.7%	4	1.0%
70.700 CORNEAL DYSTROPHY	10	0.7%	6	1.5%
UVEA				
93.110 IRIS HYPOPLASIA	2	0.1%	0	0.0%
93.120 IRIS CYST	2	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	131	8.8%	52	13.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	11	0.7%	16	4.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.3%	1	0.3%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	0.1%	1	0.3%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	2	0.1%	0	0.0%
97.120 COLOBOMA	2	0.1%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.5%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.3%
130.150 OPTIC DISC COLOBOMA	0	0.0%	1	0.3%
LENS				
100.200 CATARACT, UNSPECIFIED	8	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	59	4.0%	6	1.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	34	2.3%	3	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	11	0.7%	2	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.4%	1	0.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.2%	1	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	4	0.3%	1	0.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	85	5.7%	11	2.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	35	2.4%	5	1.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	44	3.0%	8	2.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	7	0.5%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	5	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	5	0.3%	2	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.1%	3	0.8%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.2%	4	1.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	1	0.3%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.3%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.3%
100.330 GENERALIZED/ COMPLETE CATARACT	29	2.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	8	0.5%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***284***	***19.1%***	***44***	***11.2%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	10	0.7%	1	0.3%

OCULAR DISORDERS REPORT
BRUSSELS GRIFFON

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,486 #	 %	Year Examined: 2018-2022 Total # Dogs: 393 #	 %
VITREOUS Continued				
110.135 PHPV/ PTVL	2	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	91	6.1%	12	3.1%
110.320 VITREOUS DEGENERATION SYNERESIS	261	17.6%	26	6.6%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	28	1.9%	7	1.8%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	13	0.9%	3	0.8%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	23	1.5%	1	0.3%
120.400 RETINAL HEMORRHAGE	2	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
120.960 RETINOPATHY	1	0.1%	0	0.0%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	3	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	19	1.3%	1	0.3%
OTHER				
900.000 OTHER, UNSPECIFIED	26	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED	29	2.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	30	2.0%	18	4.6%
NORMAL				
.000 NORMAL GLOBE	893	60.1%	259	65.9%

BULL TERRIER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BULL TERRIER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
BULL TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 247 #	 %	2018-2022 22 #	 %
GLOBE				
.110 MICROPHTHALMIA	3	1.2%	0	0.0%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	2	0.8%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	1	0.4%	0	0.0%
25.110 DISTICHIASIS	5	2.0%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	0.4%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	5	2.0%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	8	3.2%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	4	1.6%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	12	4.9%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.4%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.4%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	6	2.4%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	3	1.2%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.8%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.8%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.4%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.4%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.4%	1	4.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.4%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	3	1.2%	1	4.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.4%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.4%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	3	1.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	7	2.8%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***20***	***8.1%***	***2***	***9.1%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.4%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	4	1.6%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	0.4%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	4.5%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.4%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.8%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	3	1.2%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	3	1.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	5	2.0%	0	0.0%
900.100 OTHER, NOT INHERITED	8	3.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	1.2%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	194	78.5%	19	86.4%

BULLDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Keratoconjunctivitis sicca	Not defined	6	NO	
B.	Entropion	Not defined	1	Breeder option	
C.	Ectropion	Not defined	1	Breeder option	
D.	Distichiasis	Not defined	1, 2	Breeder option	
E.	Ectopic cilia	Not defined	1	Breeder option	
F.	Prolapsed gland of third eyelid	Not defined	1, 3-6	Breeder option	
G.	Keratitis	Not defined	1	Passes with no notation	
H.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
I.	Cataract	Not defined	1	NO	
J.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
K.	Multifocal retinopathy - *cmr1*	Autosomal recessive	7, 8	NO (Breeder option with Normal DNA test for CMR)	Mutation in the *BEST1* gene

Description and Comments

A. Keratoconjunctivitis sicca

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation due to

exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

In the Bulldog, ectropion is associated with an exceptionally large palpebral fissure and laxity of the canthal structures. Central lower lid ectropion is often associated with entropion of the adjacent lid. This causes severe ocular irritation.

D. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

In the Bulldog, these abnormal eyelashes may be associated with significant clinical disease and breeding of affected animals should be discouraged.

E. Ectopic cilia

Hair emerging through the eyelid conjunctiva. Ectopic cilia occur more frequently in younger dogs and cause discomfort and corneal disease.

F. Prolapse of the gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated and severe chronic inflammation or keratoconjunctivitis sicca/dry eye syndrome may ensue. Commonly referred to as "cherry eye."

Bulldogs were overrepresented in a study of prolapsed gland of the third eyelid. In the study, 100% of the prolapsed glands in Bulldogs occurred before 1 year of age. Bulldogs were also more likely to develop bilateral prolapsed glands that occurred either simultaneously with the first prolapse or with a short time interval between prolapses.

G. Keratitis

A specific designation does not exist on the CAER form for this condition. We ask examiners to mark other – unlisted conditions suspected as inherited. Then in the comments box please write “keratitis”.

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. Often associated with entropion or a combination of entropion and ectropion.

H. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

I. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may

involve the lens completely (diffuse) or in a localized region.

J. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

K. Multifocal Retinopathy

A specific designation does not exist on the CAER form for this condition. We ask examiners to mark other – unlisted conditions suspected as inherited. Then in the comments box please write multifocal retinopathy.

Canine Multifocal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog. The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas. Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Abstracts: "Epidemiology and Clinical Significance of Canine Distichiasis: A Retrospective Study of 291 Cases" Annual Scientific Meeting of the European College of Veterinary Ophthalmologists, Online, May 20-23, 2021. Vet Ophthalmol. 2022 Mar;25(2):e1-e43. doi: 10.1111/vop.12979. Epub 2022 Mar 14. PMID: 35285574.

3. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med*. 1976;20:39-67.

4. Morgan RV, Duddy JM, McClurg K. Prolapse of the gland of the third eyelid in the dog: A retrospective study of 89 cases (1980-1990). *J Am Anim Hosp Assoc*. 1993;29:56.

5. Mazzucchelli S, Vaillant MD, Weverberg F, et al. Retrospective study of 155 cases of prolapse of the nictitating membrane gland in dogs. *Vet Rec*. 2012;170:443.

6. Kaswan RL, Martin CL, Chapman WL, Jr. Keratoconjunctivitis sicca: histopathologic study of nictitating membrane and lacrimal glands from 28 dogs. *Am J Vet Res*. 1984;45:112-118.

7. Guziewicz KE, Slavik J, Lindauer SP et al. Molecular consequences of BEST1 gene mutations in canine multifocal retinopathy predict functional implications for human bestrophinopathies. IOVS

52(7) 2011; 4497-505.

8. Donner J, Kaukonen M, Anderson H et al. Genetic panel screening of nearly 100 mutations reveals new insights into the breed distribution of risk variants for canine hereditary disorders. PLOS One Aug 2016 11 (8): 1-18.

OCULAR DISORDERS REPORT
BULLDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,376 #	 %	Year Examined: 2018-2022 Total # Dogs: 392 #	 %
GLOBE				
.110 MICROPHTHALMIA	1	0.1%	1	0.3%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.3%
EYELIDS				
20.140 ECTOPIC CILIA	12	0.9%	2	0.5%
20.160 MACROPALPEBRAL FISSURE	16	1.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	203	14.8%	49	12.5%
22.000 ECTROPION, UNSPECIFIED	69	5.0%	12	3.1%
25.110 DISTICHIASIS	314	22.8%	93	23.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	3	0.8%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	4	0.3%	2	0.5%
40.910 KERATOCONJUNCTIVITIS SICCA	10	0.7%	2	0.5%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	22	1.6%	1	0.3%
CORNEA				
70.210 PANNUS	10	0.7%	3	0.8%
70.220 PIGMENTARY KERATITIS	29	2.1%	4	1.0%
70.700 CORNEAL DYSTROPHY	11	0.8%	6	1.5%
UVEA				
93.120 IRIS CYST	8	0.6%	4	1.0%
93.170 ANTERIOR CHAMBER CYST	1	0.1%	1	0.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	11	0.8%	4	1.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.1%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
95.120 CILIARY BODY CYST	2	0.1%	1	0.3%
LENS				
100.200 CATARACT, UNSPECIFIED	1	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	35	2.5%	6	1.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	7	0.5%	3	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.1%	1	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	3	0.8%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	6	0.4%	1	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR	2	0.1%	2	0.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	5	0.4%	4	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	2	0.1%	1	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	4	0.3%	2	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	4	0.3%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.1%	1	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.3%
100.328 Y-SUTURE TIP OPACITIES	6	0.4%	4	1.0%
100.330 GENERALIZED/ COMPLETE CATARACT	5	0.4%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.2%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***42***	***3.1%***	***21***	***5.4%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	2	0.1%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	84	6.1%	6	1.5%

OCULAR DISORDERS REPORT
BULLDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,376 #	 %	Year Examined: 2018-2022 Total # Dogs: 392 #	 %
RETINA Continued				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	4	0.3%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.1%	0	0.0%
120.960 RETINOPATHY	1	0.1%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	8	2.0%
130.110 MICROPAPILLA	0	0.0%	1	0.3%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.3%
OTHER				
900.000 OTHER, UNSPECIFIED	7	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED	40	2.9%	1	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	58	4.2%	24	6.1%
NORMAL				
.000 NORMAL GLOBE	779	56.6%	210	53.6%

BULLMASTIFF

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Ectropion	Not defined	1	Breeder option	
C.	Distichiasis	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Retinal atrophy (*RHO)*	Autosomal dominant	2	NO	Mutation in the *RHO* gene
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
H.	Multifocal retinopathy - *cmr1*	Autosomal recessive	3	NO (Breeder option with Normal DNA test for CMR)	Mutation in the *BEST1* gene

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

In the Bullmastiff, the palpebral fissures may become vertical and/or shaped like a "pagoda." Entropion in the Bullmastiff is severe and may require multiple surgical corrections.

B. Ectropion

A conformational defect resulting in eversion (rolling-out) of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Retinal atrophy - *RHO*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA in the Bullmastiff is inherited as an autosomal dominant trait. A DNA test is available.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

H. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous sub-retinal fluid, or accumulation of sub-retinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Kijas JW, Cideciyan AV, Aleman TS, et al. Naturally occurring rhodopsin mutation in the dog causes retinal dysfunction and degeneration mimicking human dominant retinitis pigmentosa. *Proc Natl Acad Sci U S A*. 2002 Apr 30;99:6328-6333. PMID: 11972042

3. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci.* 2007 May;48:1959-1967. PMID: 17460247

OCULAR DISORDERS REPORT
BULLMASTIFF

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,926 #	 %	2018-2022 670 #	 %
GLOBE				
.110 MICROPHTHALMIA	5	0.3%	0	0.0%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	16	0.8%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	108	5.6%	48	7.2%
22.000 ECTROPION, UNSPECIFIED	29	1.5%	7	1.0%
25.110 DISTICHIASIS	54	2.8%	9	1.3%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.1%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	2	0.1%	1	0.1%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
CORNEA				
70.210 PANNUS	2	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS	5	0.3%	4	0.6%
70.700 CORNEAL DYSTROPHY	2	0.1%	3	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	9	0.5%	5	0.7%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.1%	0	0.0%
93.150 IRIS COLOBOMA	3	0.2%	1	0.1%
93.170 ANTERIOR CHAMBER CYST	0	0.0%	6	0.9%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	76	3.9%	27	4.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	10	0.5%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	25	1.3%	4	0.6%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	7	0.4%	1	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.3%	4	0.6%
95.120 CILIARY BODY CYST	1	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	0.1%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	1	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	61	3.2%	13	1.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	11	0.6%	5	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	5	0.3%	2	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	5	0.3%	2	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS	2	0.1%	1	0.1%
100.307 PUNCTATE CATARACT, CAPSULAR	3	0.2%	3	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	12	0.6%	5	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	13	0.7%	4	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	11	0.6%	3	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	3	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	5	0.3%	3	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.1%	1	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.2%	1	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	3	0.2%	3	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT	8	0.4%	0	0.0%

OCULAR DISORDERS REPORT
BULLMASTIFF

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,926 #	 %	Year Examined: 2018-2022 Total # Dogs: 670 #	 %
LENS Continued				
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***91***	***4.7%***	***31***	***4.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	2	0.3%
110.135 PHPV/ PTVL	1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	2	0.1%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	4	0.6%
120.960 RETINOPATHY	0	0.0%	1	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	96	5.0%	25	3.7%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	3	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.2%	0	0.0%
120.960 RETINOPATHY	6	0.3%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	8	0.4%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	7	0.4%	1	0.1%
130.150 OPTIC DISC COLOBOMA	2	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	25	1.3%	0	0.0%
900.100 OTHER, NOT INHERITED	42	2.2%	2	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	31	1.6%	23	3.4%
NORMAL				
.000 NORMAL GLOBE	1,458	75.7%	500	74.6%

CA DE BOU

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CA DE BOU breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
CA DE BOU

There are no statistics available for this breed

CAIRN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ocular melanosis with and without glaucoma	Presumed autosomal dominant	1, 2	NO
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO
D.	Vitreous degeneration			
	- syneresis	Not defined	1	Breeder option
E.	Persistent hyaloid artery remnant	Not defined	1	Breeder option

Description and Comments

A. Ocular melanosis with and without glaucoma
(Previously ocular melanosis with secondary glaucoma, previously pigmentary glaucoma)

A proliferation of melanocytes within the uveal tract associated with an elevation in intraocular pressure. Obstruction of the aqueous outflow pathways occurs resulting in glaucoma. This condition has been identified most commonly in the Cairn Terrier. The condition is familial but the exact mode of inheritance is unknown (pedigree anaylsis has ruled out a sex-linked disorder). In the Cairn Terrier, the disease is very slowly progressive and blindness ultimately results. Some dogs develop episodes of anterior uveitis associated with the shedding of large amounts of pigment from the iris surface. There is a long pre-glaucomatous phase of the disease in which diagnosis of the condition is possible. Age of onset varies from 2-14 years.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Petersen-Jones SM, Forcier J, Mentzer AL. Ocular melanosis in the Cairn Terrier: clinical description and investigation of mode of inheritance. *Vet Ophthalmol*. 2007;10 Suppl 1:63-69. PMID: 17973836

OCULAR DISORDERS REPORT
CAIRN TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4,238 #	%	2018-2022 683 #	%
GLOBE				
.110 MICROPHTHALMIA	2	0.0%	0	0.0%
10.000 GLAUCOMA	3	0.1%	0	0.0%
EYELIDS				
25.110 DISTICHIASIS	17	0.4%	4	0.6%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	2	0.3%
40.910 KERATOCONJUNCTIVITIS SICCA	8	0.2%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	1	0.1%
CORNEA				
70.210 PANNUS	1	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	7	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY	28	0.7%	1	0.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	3	0.1%	0	0.0%
UVEA				
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150 IRIS COLOBOMA	2	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	374	8.8%	126	18.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	13	0.3%	3	0.4%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	39	0.9%	21	3.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	11	0.3%	5	0.7%
93.810 UVEAL MELANOMA	1	0.0%	1	0.1%
93.930 OCULAR MELANOCYTOSIS	9	0.2%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	2	0.0%	0	0.0%
97.120 COLOBOMA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	11	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	252	5.9%	52	7.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	65	1.5%	35	5.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	46	1.1%	7	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	36	0.8%	9	1.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	11	0.3%	4	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS	5	0.1%	2	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR	23	0.5%	10	1.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	41	1.0%	14	2.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	67	1.6%	14	2.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	34	0.8%	3	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	10	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	5	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	6	0.1%	1	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	13	0.3%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	14	0.3%	3	0.4%

OCULAR DISORDERS REPORT
CAIRN TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4,238 #	 %	Year Examined: 2018-2022 Total # Dogs: 683 #	 %
LENS Continued				
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.1%	1	0.1%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	3	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	1	0.0%	1	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT	37	0.9%	2	0.3%
100.340 RESORBING/ HYPERMATURE CATARACT	2	0.0%	2	0.3%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	1	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***434***	***10.2%***	***110***	***16.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	47	1.1%	9	1.3%
110.135 PHPV/ PTVL	6	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	48	1.1%	11	1.6%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	21	0.5%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	8	0.2%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	23	0.5%	0	0.0%
120.960 RETINOPATHY	1	0.0%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	3	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	8	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	11	0.3%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	76	1.8%	0	0.0%
900.100 OTHER, NOT INHERITED	128	3.0%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	132	3.1%	29	4.2%
NORMAL				
.000 NORMAL GLOBE	3,233	76.3%	423	61.9%

CANAAN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
CANAAN DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 544 #	 %	Year Examined: 2018-2022 Total # Dogs: 79 #	 %
EYELIDS				
25.110 DISTICHIASIS	15	2.8%	1	1.3%
CORNEA				
70.700 CORNEAL DYSTROPHY	4	0.7%	0	0.0%
UVEA				
93.120 IRIS CYST	1	0.2%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	21	3.9%	3	3.8%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.2%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.2%	1	1.3%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	20	3.7%	6	7.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.4%	1	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	4	0.7%	1	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.2%	1	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.6%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	7	1.3%	3	3.8%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	12	2.2%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.2%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	1	0.2%	1	1.3%
100.330 GENERALIZED/ COMPLETE CATARACT	13	2.4%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***50***	***9.2%***	***6***	***7.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	0.4%	1	1.3%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	9	1.7%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	6	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	18	3.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	6	1.1%	3	3.8%
NORMAL				
.000 NORMAL GLOBE	444	81.6%	65	82.3%

CANADIAN ESKIMO DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
CANADIAN ESKIMO DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 42 #	 %	Year Examined: 2018-2022 Total # Dogs: 15 #	 %
CORNEA				
70.700 CORNEAL DYSTROPHY	1	2.4%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	9	21.4%	4	26.7%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	6.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	6.7%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	1	6.7%
100.307 PUNCTATE CATARACT, CAPSULAR	1	2.4%	1	6.7%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***2.4%***	***3***	***20.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	2.4%	0	0.0%
RETINA				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	2.4%	0	0.0%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.8%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	32	76.2%	8	53.3%

CANE CORSO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Ectropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Dental-skeletal-retinal anomaly (DSRA)	Autosomal recessive	2	NO	Mutation in *MIA3*

Description and Comments

A. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Dental-skeletal-retinal anomaly (DSRA)

Dental-Skeletal-Retinal-Anomaly (DSRA) is a syndromic condition documented in the Cane Corso. This condition is associated with a MIA3 splice defect that has been identified in all affected dogs with an autosomal recessive inheritance pattern. Clinically affected dogs present with dwarfism, dental abnormalities including loss of enamel and tooth discoloration, as well as early onset retinal atrophy.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breed Report.
2. Christen M, Booij-Vrieling H, Oksa-Minalto J, de Vries C, Kehl A, Jagannathan V, Leeb T.*MIA3* Splice Defect in Cane Corso Dogs with Dental-Skeletal-Retinal Anomaly (DSRA). Genes (Basel). 2021 Sep 25;12(10):1497. doi: 10.3390/genes12101497. PMID: 34680893; PMCID: PMC8535341.

OCULAR DISORDERS REPORT
CANE CORSO

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 179 #	 %	Year Examined: 2018-2022 Total # Dogs: 180 #	 %
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	5	2.8%	3	1.7%
22.000 ECTROPION, UNSPECIFIED	11	6.1%	4	2.2%
25.110 DISTICHIASIS	8	4.5%	10	5.6%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	0.6%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	3	1.7%	1	0.6%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	0.6%	3	1.7%
UVEA				
93.110 IRIS HYPOPLASIA	1	0.6%	0	0.0%
93.120 IRIS CYST	2	1.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.6%	1	0.6%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3	1.7%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	1	0.6%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	1.1%	2	1.1%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	4.5%	4	2.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	3	1.7%	1	0.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	1.1%	1	0.6%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	1.1%	1	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.6%	2	1.1%
100.307 PUNCTATE CATARACT, CAPSULAR	2	1.1%	1	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.6%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.6%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	1	0.6%	1	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.6%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.6%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***13***	***7.3%***	***6***	***3.3%***
VITREOUS				
110.135 PHPV/ PTVL	1	0.6%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	0	0.0%	1	0.6%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.6%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	0.6%	1	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.6%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.6%
120.960 RETINOPATHY	1	0.6%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED	0	0.0%	1	0.6%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	1.1%	7	3.9%
NORMAL				
.000 NORMAL GLOBE	141	78.8%	144	80.0%

CAO DE CASTRO LABOREIRO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CAO DE CASTRO LABOREIRO breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
CAO DE CASTRO LABOREIRO

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		0	
Diagnostic Name		**#**	**%**	**#**	**%**
NORMAL					
.000	NORMAL GLOBE	1	100.0%	0	

CARDIGAN WELSH CORGI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Retinal atrophy - rod-cone dysplasia type 3 (*rcd3*)	Presumed autosomal recessive	2-4	NO	Mutation in the *PDE6A* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin that may cause ocular irritation. Distichiasis may occur any time in the life of the dog. It is difficult to make a strong recommendation about breeding dogs with this entity. The hereditary basis is not known although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies.

D. Retinal atrophy - rod-cone dysplasia type 3 (*rcd3*)

PRA in the Cardigan Welsh Corgi is an autosomal recessive trait caused by a one base pair deletion in the gene encoding the alpha subunit of cyclic GMP phosphodiesterase (rcd3). PRA begins early in life with clinical signs of night blindness and a lack of rod ERG responses is seen at 6-8 weeks of age. Dogs are completely blind by 2-3 years of age when ophthalmoscopic signs are first visible. The mutation is found in the *PDE6A* gene. A DNA test is available.

Historical Note:

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Petersen-Jones SM, Entz DD, Sargan DR. cGMP phosphodiesterase-alpha mutation causes progressive retinal atrophy in the Cardigan Welsh Corgi dog. *Invest Ophthalmol Vis Sci*. 1999;40:1637-1644. PMID: 10393029

3. Petersen-Jones SM, Entz DD. An improved DNA-based test for detection of the codon 616 mutation in the alpha cyclic GMP phosphodiesterase gene that causes progressive retinal atrophy in the Cardigan Welsh Corgi. *Vet Ophthalmol*. 2002;5:103-106. PMID: 12071867 DOI: 10.1046/j.1463-5224.2002.00223.x

4. Keep JM. Clinical aspects of progressive retinal atrophy in the Cardigan Welsh Corgi.*Aust Vet J*.1972;48:197-199.PMID: 5082485 DOI: 10.1111/j.1751-0813.1972.tb09275.x

OCULAR DISORDERS REPORT
CARDIGAN WELSH CORGI

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	3,927		639	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	2	0.1%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	146	3.7%	22	3.4%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	17	0.4%	1	0.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	1	0.2%
UVEA					
93.120	IRIS CYST	0	0.0%	1	0.2%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.180	IIRIS SPHINCTER DYSPLASIA	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	112	2.9%	13	2.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.1%	1	0.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	9	0.2%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	0.2%
93.810	UVEAL MELANOMA	1	0.0%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	3	0.1%	0	0.0%
97.120	COLOBOMA	2	0.1%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.3%
LENS					
100.200	CATARACT, UNSPECIFIED	15	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	128	3.3%	20	3.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	13	0.3%	8	1.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	14	0.4%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	17	0.4%	4	0.6%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.1%	1	0.2%
100.306	PUNCTATE CATARACT, NUCLEUS	7	0.2%	3	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR	16	0.4%	5	0.8%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	34	0.9%	5	0.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	19	0.5%	5	0.8%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	16	0.4%	2	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.1%	1	0.2%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.1%	3	0.5%
100.316	INCIPIENT CATARACT, NUCLEUS	7	0.2%	2	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	3	0.1%	2	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	1	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.2%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	3	0.1%	1	0.2%
100.330	GENERALIZED/ COMPLETE CATARACT	8	0.2%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***184***	***4.7%***	***43***	***6.7%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	5	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	5	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	5	0.1%	1	0.2%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	24	0.6%	1	0.2%

OCULAR DISORDERS REPORT
CARDIGAN WELSH CORGI

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 3,927 #	 %	Year Examined: 2018-2022 Total # Dogs: 639 #	 %
RETINA Continued					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	6	0.2%	1	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	9	0.2%	0	0.0%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
120.960	RETINOPATHY	1	0.0%	0	0.0%
OPTIC NERVE					
130.120	OPTIC NERVE HYPOPLASIA	3	0.1%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	16	0.4%	0	0.0%
900.100	OTHER, NOT INHERITED	39	1.0%	1	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	24	0.6%	20	3.1%
NORMAL					
.000	NORMAL GLOBE	3,440	87.6%	545	85.3%

CAROLINA DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CAROLINA DOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
CAROLINA DOG

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	0		11	
Diagnostic Name	**#**	**%**	**#**	**%**
NORMAL				
.000 NORMAL GLOBE	0		11	100.0%

CATALAN SHEEPDOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CATALAN SHEEPDOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
CATALAN SHEEPDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1 #	%	2018-2022 0 #	%
UVEA				
93.150 IRIS COLOBOMA	1	100.0%	0	

CAUCASIAN SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CAUCASIAN SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
CAUCASIAN SHEPHERD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 13 #	 %	Year Examined: 2018-2022 Total # Dogs: 7 #	 %
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	1	7.7%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	1	7.7%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	7.7%	1	14.3%
LENS				
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1	7.7%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	7.7%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	7.7%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	7.7%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	7.7%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***5***	***38.5%***	***0***	***0.0%***
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	14.3%
NORMAL				
.000 NORMAL GLOBE	9	69.2%	5	71.4%

CAVALIER KING CHARLES SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	2	NO
B.	Keratoconjunctivitis sicca	Not defined	3	NO
C.	Congenital KCS and ichthyosiform dermatosis	Autosomal recessive	4, 5	NO
D.	Entropion	Not defined	1	Breeder option
E.	Distichiasis	Not defined	1, 8	Breeder option
F.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1, 6	Breeder option
G.	Exposure/pigmentary keratitis	Not defined	1	Breeder option
H.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
I.	Cataract	Not defined	1, 2, 7	NO
J.	Y-suture tip opacity	Not defined	1	Breeder option
K.	Vitreous degeneration			
	- syneresis	Not defined	1	Breeder option
L.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
	- geographic	Not defined	1	NO

Description and Comments

A. Microphthalmia

Microphthalmia is a congenital defect characterized by a small eye often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens and/or retina.

B. Keratoconjunctivitis sicca (KCS)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

C. Congenital KCS and ichthyosiform dermatosis

A syndrome in which dogs are born with severe to absolute keratoconjunctivitis sicca (KCS) which is poorly responsive to lacrimostimulant treatment. Co-morbid congenital dermatopathy affecting haircoat, skin and footpads is severe and requires intensive life-long care. Clinical signs are so devastating that affected dogs are often euthanized.

D. Entropion

A conformational defect resulting in "in-rolling" of one or both of the eyelids, which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

E. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

F. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral. In the Cavalier King Charles Spaniel, lesions are circular or semicircular central crystalline deposits in the anterior corneal stroma that appear between 2 and 5 years of age. It may be associated with exophthalmos and lagophthalmos common in these dogs.

G. Exposure/pigmentary keratitis

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

H. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

I. Cataract

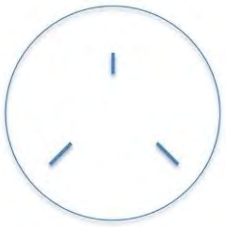
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may

involve the lens completely (diffuse) or in a localized region.

In the Cavalier King Charles Spaniel, onset is at an early age (less than 6 months), affecting the cortex and nucleus with rapid progression to complete cataract, resulting in blindness.

J. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

K. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

L. Retinal dysplasia

- folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

- geographic

An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Narfstrom K, Dubielzig R. Posterior lenticonus, cataracts and microphthalmia: Congenital defects in the Cavalier King Charles spaniel. *J Small Anim Pract*. 1984;25.

3. Sanchez RF, Innocent G, Mould J, et al. Canine keratoconjunctivitis sicca: disease trends in a review of 229 cases. *J Small Anim Pract*. 2007;48:211-217. PMID: 17381766 DOI: 10.1111/j.1748-5827.2006.00185.x

4. Hartley C, Donaldson D, Smith KC, et al. Congenital keratoconjunctivitis sicca and ichthyosiform dermatosis in 25 Cavalier King Charles spaniel dogs – part I: clinical signs, histopathology, and inheritance. *Vet Ophthalmol*. 2012;15:315-326. PMID: 22212237 DOI:10.1111/j.1463-5224.2011.00986.x

5. Barnett KC. Congenital keratoconjunctivitis sicca and ichthyosiform dermatosis in the Cavalier King Charles Spaniel. *J Small Anim Pract*. 2006;47:524-528. PMID: 16961470. DOI:10.1111/j.1748-5827.2006.00107.x

6. Crispin SM, Barnett KC. Dystrophy, degeneration and infiltration of the canine cornea. *J Small Anim Pract*. 1983;24:63-83.

7. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract*. 1985;26:305-316.

8. ECVO 2021 abstract: Jondeau C, Gounon M, Bourguet A, Chahory S. "Epidemiology and Clinical Significance of Canine Distichiasis: A Retrospective Study of 291 Cases". PMID: 35285574.

OCULAR DISORDERS REPORT
CAVALIER KING CHARLES SPANIEL

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	56,382		17,258	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	84	0.1%	17	0.1%
10.000	GLAUCOMA	3	0.0%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	10	0.1%
EYELIDS					
20.140	ECTOPIC CILIA	3	0.0%	1	0.0%
20.160	MACROPALPEBRAL FISSURE	126	0.2%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	226	0.4%	70	0.4%
22.000	ECTROPION, UNSPECIFIED	11	0.0%	0	0.0%
25.110	DISTICHIASIS	5,124	9.1%	1,560	9.0%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	22	0.1%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	51	0.1%	28	0.2%
40.910	KERATOCONJUNCTIVITIS SICCA	106	0.2%	19	0.1%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	1	0.0%	1	0.0%
51.100	THIRD EYELID CARTILAGE ANOMALY	7	0.0%	2	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	20	0.0%	5	0.0%
CORNEA					
70.210	PANNUS	16	0.0%	3	0.0%
70.220	PIGMENTARY KERATITIS	299	0.5%	123	0.7%
70.700	CORNEAL DYSTROPHY	4,972	8.8%	1,329	7.7%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	56	0.1%	11	0.1%
UVEA					
90.250	PIGMENTARY UVEITIS	0	0.0%	1	0.0%
93.110	IRIS HYPOPLASIA	4	0.0%	3	0.0%
93.120	IRIS CYST	20	0.0%	6	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	7	0.0%	0	0.0%
93.150	IRIS COLOBOMA	4	0.0%	1	0.0%
93.170	ANTERIOR CHAMBER CYST	5	0.0%	1	0.0%
93.180	IIRIS SPHINCTER DYSPLASIA	2	0.0%	1	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	616	1.1%	225	1.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	37	0.1%	6	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	35	0.1%	1	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	44	0.1%	1	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	49	0.1%	45	0.3%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	11	0.0%	2	0.0%
95.120	CILIARY BODY CYST	1	0.0%	3	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	7	0.0%	5	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	9	0.0%	3	0.0%
97.120	COLOBOMA	4	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	216	1.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	100	0.6%
120.190	RETINAL DYSPLASIA, DETACHED	0	0.0%	8	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	8	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	4	0.0%
120.960	RETINOPATHY	0	0.0%	2	0.0%
130.110	MICROPAPILLA	0	0.0%	2	0.0%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.0%
130.150	OPTIC DISC COLOBOMA	0	0.0%	10	0.1%
LENS					
100.200	CATARACT, UNSPECIFIED	57	0.1%	0	0.0%

OCULAR DISORDERS REPORT
CAVALIER KING CHARLES SPANIEL

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	56,382		17,258	
	Diagnostic Name	#	%	#	%
LENS Continued					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2,048	3.6%	484	2.8%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	486	0.9%	237	1.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	170	0.3%	54	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	161	0.3%	53	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	70	0.1%	26	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	237	0.4%	90	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	182	0.3%	82	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR	104	0.2%	50	0.3%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	420	0.7%	121	0.7%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	312	0.6%	79	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	177	0.3%	49	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	32	0.1%	9	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	89	0.2%	38	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	260	0.5%	69	0.4%
100.317	INCIPIENT CATARACT, CAPSULAR	75	0.1%	38	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	38	0.1%	27	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	51	0.1%	43	0.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	10	0.0%	8	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	7	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	28	0.0%	23	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	12	0.0%	6	0.0%
100.328	Y-SUTURE TIP OPACITIES	91	0.2%	176	1.0%
100.330	GENERALIZED/ COMPLETE CATARACT	223	0.4%	22	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	10	0.0%	4	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	16	0.0%	2	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***3,211***	***5.7%***	***1,128***	***6.5%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	92	0.2%	37	0.2%
110.135	PHPV/ PTVL	32	0.1%	3	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	40	0.1%	8	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	233	0.4%	52	0.3%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	3,888	6.9%	355	2.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1,596	2.8%	148	0.9%
120.190	RETINAL DYSPLASIA, DETACHED	172	0.3%	15	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	159	0.3%	8	0.0%
120.400	RETINAL HEMORRHAGE	6	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	20	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	3	0.0%	1	0.0%
120.960	RETINOPATHY	35	0.1%	24	0.1%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	27	0.0%	4	0.0%
130.120	OPTIC NERVE HYPOPLASIA	15	0.0%	3	0.0%
130.150	OPTIC DISC COLOBOMA	35	0.1%	18	0.1%
OTHER					
900.000	OTHER, UNSPECIFIED	596	1.1%	0	0.0%
900.100	OTHER, NOT INHERITED	1,159	2.1%	11	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	894	1.6%	763	4.4%
NORMAL					
.000	NORMAL GLOBE	40,548	71.9%	12,032	69.7%

CENTRAL ASIAN SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CENTRAL ASIAN SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
CENTRAL ASIAN SHEPHERD

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	7		12	
	Diagnostic Name	**#**	**%**	**#**	**%**
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	0	0.0%	1	8.3%
CORNEA					
70.700	CORNEAL DYSTROPHY	0	0.0%	1	8.3%
UVEA					
93.120	IRIS CYST	0	0.0%	1	8.3%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	14.3%	2	16.7%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	28.6%	1	8.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	14.3%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	1	14.3%	1	8.3%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***1***	***14.3%***	***0***	***0.0%***
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	8.3%
NORMAL					
.000	NORMAL GLOBE	4	57.1%	6	50.0%

CESKY TERRIER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CESKY TERRIER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
CESKY TERRIER

Diagnostic Name	1993-2017 # (Total # Dogs: 123)	1993-2017 %	2018-2022 # (Total # Dogs: 24)	2018-2022 %
EYELIDS				
25.110 DISTICHIASIS	19	15.4%	0	0.0%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.8%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	8	6.5%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	4	3.3%	2	8.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	2	8.3%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.8%	1	4.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	0	0.0%	1	4.2%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	0.8%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.8%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	1	0.8%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.8%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.8%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	2	1.6%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.8%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.8%	1	4.2%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***6***	***4.9%***	***1***	***4.2%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	8	6.5%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.8%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.8%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	4	3.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.8%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	84	68.3%	18	75.0%

CHART POLSKI

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CHART POLSKI breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
CHART POLSKI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 10 #	%	Year Examined: 2018-2022 Total # Dogs: 5 #	%
EYELIDS				
25.110 DISTICHIASIS	1	10.0%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	10.0%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	2	20.0%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	10.0%	0	0.0%
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	10.0%	0	0.0%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	1	10.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	3	30.0%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	3	30.0%	5	100.0%

CHESAPEAKE BAY RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Not defined	1, 2	NO	
D.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	3	NO	Mutation in the *prcd* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located in the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Hereditary cataracts have been described in the Chesapeake Bay Retriever and affect the young adult dog. They appear as posterior cortical, axial, triangular opacities and the Y suture tips can be affected in both the anterior and

posterior cortices. Extension of the cataract into the posterior cortex and progression to impair vision can occur. An autosomal dominant inheritance with incomplete penetrance has been proposed; however, the genetics have not been completely defined and additional studies will be required.

D. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Chesapeake Bay Retriever is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available. It is important to note than in all breeds in which a molecular diagnostic test for the disease is available, it is possible to have dogs diagnosed clinically as affected, yet the DNA test results are normal. This suggests that other genetic causes of PRA exist or that the diagnosed affected dog has an acquired disease that mimics the inherited disorder.

A second, less common form of PRA is also present in the Chesapeake Bay Retriever with ophthalmoscopic abnormalities characteristic of mid-stage disease found in dogs between 8-12 months of age. The lesions are progressive and end-stage lesions are evident by 2-3 years of age. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gelatt KN. Cataracts in Chesapeake Bay retrievers. *J Am Vet Med Assoc*. 1979;175:1176-1178. PMID: 511742

3. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

OCULAR DISORDERS REPORT
CHESAPEAKE BAY RETRIEVER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	13,513		1,739	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	7	0.1%	1	0.1%
10.000	GLAUCOMA	4	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	2	0.0%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	3	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	56	0.4%	2	0.1%
22.000	ECTROPION, UNSPECIFIED	7	0.1%	0	0.0%
25.110	DISTICHIASIS	997	7.4%	156	9.0%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	3	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	1	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	84	0.6%	10	0.6%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	1	0.1%
UVEA					
93.110	IRIS HYPOPLASIA	0	0.0%	1	0.1%
93.120	IRIS CYST	23	0.2%	9	0.5%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	3	0.0%	4	0.2%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	241	1.8%	58	3.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	11	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.0%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	14	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	57	0.4%	61	3.5%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.0%	0	0.0%
93.810	UVEAL MELANOMA	1	0.0%	1	0.1%
95.120	CILIARY BODY CYST	2	0.0%	1	0.1%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	3	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.1%
120.960	RETINOPATHY	0	0.0%	1	0.1%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	2	0.1%
130.110	MICROPAPILLA	0	0.0%	1	0.1%
LENS					
100.200	CATARACT, UNSPECIFIED	74	0.5%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	584	4.3%	93	5.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	74	0.5%	33	1.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	132	1.0%	25	1.4%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	51	0.4%	9	0.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	16	0.1%	5	0.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	58	0.4%	6	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	15	0.1%	12	0.7%
100.307	PUNCTATE CATARACT, CAPSULAR	55	0.4%	30	1.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	66	0.5%	18	1.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	235	1.7%	37	2.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	59	0.4%	13	0.7%

OCULAR DISORDERS REPORT
CHESAPEAKE BAY RETRIEVER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 13,513 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,739 #	 %
LENS Continued				
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	8	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	53	0.4%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	24	0.2%	2	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	25	0.2%	7	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	5	0.0%	5	0.3%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	2	0.0%	2	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	4	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	14	0.1%	8	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT	43	0.3%	1	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	7	0.1%	2	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,003***	***7.4%***	***208***	***12.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	21	0.2%	2	0.1%
110.135 PHPV/ PTVL	10	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	54	0.4%	17	1.0%
110.320 VITREOUS DEGENERATION SYNERESIS	48	0.4%	7	0.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	84	0.6%	3	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	50	0.4%	4	0.2%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	93	0.7%	3	0.2%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	8	0.1%	3	0.2%
120.970 CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	2	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	2	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	127	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	336	2.5%	2	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	201	1.5%	101	5.8%
NORMAL				
.000 NORMAL GLOBE	10,962	81.1%	1,230	70.7%

CHIHUAHUA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- endothelial	Not defined	2	NO	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Vitreous degeneration				
	- anterior chamber	Not defined	1	Breeder option	
	- syneresis	Not defined	1	Breeder option	
F.	Retinal atrophy (*prcd*)	Autosomal recessive	3, 4	NO	Mutation in the *prcd* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - endothelial

An abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

In the Chihuahua, this is a primary degenerative endothelial disease leading to progressive and permanent corneal edema. It is suspected to be a heritable disorder. There is no sex predilection. The condition is observed in older dogs, 6 to 13 years of age with a mean of 9.5 years. The corneal edema starts asymptomatically in the dorsal temporal corneal quadrant of one eye and slowly progresses medially, eventually involving the entire cornea. Typically, it becomes bilateral. In the later stages,

discomfort, intracorneal bullae with subsequent ulceration and keratoconus may develop. Histologically, the primary endothelial disease appears slightly different from the clinically similar disorder of the Boston Terrier.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Chihuahua is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Martin CL and Dice PF. Corneal endothelial dystrophy in the dog. *J Am Anim Hosp Assoc.* 1982;18:327.

3. Hyama M, Tada N, Mitsui H, et al. Real-time PCR genotyping in assay for canine progressive rod-cone degeneration and mutant allele frequency in Toy Poodles, Chihuahuas, and Miniature Dachshunds in Japan. J Vet Med Sci 2016; 78(3): 481. PMID: 26549343

4. Downs LM, Hitti R, Pregnolato S, et al. Genetic screening for PRA-associated mutations in multiple dog breeds shows that PRA is heterogeneous within and between breeds. *Vet Ophthalmol*. 2014;17:126-130. PMID: 24255994

OCULAR DISORDERS REPORT
CHIHUAHUA

Diagnostic Name	1993-2017 #	1993-2017 %	2018-2022 #	2018-2022 %
Year Examined:	**1993-2017**		**2018-2022**	
Total # Dogs:	**1,844**		**1,542**	
GLOBE				
.110 MICROPHTHALMIA	1	0.1%	1	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	2	0.1%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	4	0.2%	4	0.3%
25.110 DISTICHIASIS	93	5.0%	50	3.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	3	0.2%	3	0.2%
40.910 KERATOCONJUNCTIVITIS SICCA	3	0.2%	0	0.0%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	5	0.3%	4	0.3%
CORNEA				
70.220 PIGMENTARY KERATITIS	5	0.3%	3	0.2%
70.700 CORNEAL DYSTROPHY	5	0.3%	4	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	7	0.4%	2	0.1%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	134	7.3%	62	4.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	4	0.2%	3	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	7	0.4%	7	0.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	0.1%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	3	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	50	2.7%	32	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	19	1.0%	11	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	3	0.2%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.2%	1	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.1%	6	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	2	0.1%	6	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	33	1.8%	11	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	21	1.1%	7	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	9	0.5%	5	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	7	0.4%	4	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR	3	0.2%	4	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	4	0.2%	3	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	3	0.2%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.1%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	4	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	2	0.1%	2	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT	12	0.7%	1	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.1%	1	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***132***	***7.2%***	***66***	***4.3%***

OCULAR DISORDERS REPORT
CHIHUAHUA

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,844 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,542 #	 %
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	0.1%	2	0.1%
110.135 PHPV/ PTVL	2	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	17	0.9%	19	1.2%
110.320 VITREOUS DEGENERATION SYNERESIS	51	2.8%	20	1.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	7	0.4%	2	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	3	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	11	0.6%	1	0.1%
120.960 RETINOPATHY	1	0.1%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.1%	1	0.1%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.1%
130.150 OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	21	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	23	1.2%	2	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	41	2.2%	48	3.1%
NORMAL				
.000 NORMAL GLOBE	1,476	80.0%	1,287	83.5%

CHINESE CRESTED

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	4	NO	
C.	Lens luxation	Autosomal recessive	2, 3	NO	Mutation in the *ADAMTS17 gene*
D.	Vitreous degeneration				
	- anterior chamber	Not defined	1	Breeder option	
	- syneresis	Not defined	1	Breeder option	
E.	Retinal atrophy (*prcd*)	Autosomal recessive	4	NO	Mutation in the *prcd* gene
F.	Retinal atrophy - rod-cone dysplasia type 3 (rcd3)	Autosomal recessive	5, 6	NO	Mutation in the *PDE6A* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Lens luxation

Partial (subluxation) or complete displacement of the lens from its normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Chinese Crested is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

In the Chinese Crested, a second, but very infrequency type of PRA has been identified that is caused by the mutation in the *PDE6A* gene that causes PRA in Cardigan Welsh Corgis. However, most cases of PRA that test normal for the *prcd* gene defect likely results from a gene defect that is still to be identified.

F. Retinal atrophy - rod-cone dysplasia type 3 (*rcd3*)

PRA in the Chinese Crested is an autosomal recessive trait caused by a one base pair deletion in the gene encoding the alpha subunit of cyclic GMP phosphodiesterase (rcd3). PRA begins early in life with clinical signs of night blindness and a lack of rod ERG responses is seen at 6-8 weeks of age. Dogs are completely blind by 2-3 years of age when ophthalmoscopic signs are first visible. The mutation is found in the *PDE6A* gene. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010;51:4716-4721. PMID: 20375329

3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384. PMID: 22050825

4. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

5. Downs LM, Hitti R, Pregnolato S, et al. Genetic screening for PRA-associated mutations in multiple dog breeds shows that PRA is heterogeneous within and between breeds. *Vet Ophthalmol*. 2014; 17:126-130. PMID: 24255994

6. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650; PMCID: PMC4985128.

OCULAR DISORDERS REPORT
CHINESE CRESTED

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 6,741 #	%	2018-2022 535 #	%
GLOBE				
.110 MICROPHTHALMIA	4	0.1%	0	0.0%
10.000 GLAUCOMA	2	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	2	0.4%
EYELIDS				
20.140 ECTOPIC CILIA	3	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	4	0.1%	0	0.0%
25.110 DISTICHIASIS	41	0.6%	4	0.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.2%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	5	0.1%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	18	0.3%	1	0.2%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	3	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	5	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS	8	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY	36	0.5%	3	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	3	0.0%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	5	0.1%	0	0.0%
93.120 IRIS CYST	3	0.0%	0	0.0%
93.150 IRIS COLOBOMA	2	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	179	2.7%	10	1.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	11	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	10	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	5	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	0.0%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	3	0.0%	0	0.0%
95.120 CILIARY BODY CYST	1	0.0%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	3	0.0%	0	0.0%
97.120 COLOBOMA	2	0.0%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.2%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	161	2.4%	18	3.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	44	0.7%	12	2.2%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	22	0.3%	2	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	16	0.2%	2	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	5	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	9	0.1%	1	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS	12	0.2%	5	0.9%
100.307 PUNCTATE CATARACT, CAPSULAR	9	0.1%	3	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	44	0.7%	4	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	31	0.5%	2	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	31	0.5%	1	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	6	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	5	0.1%	1	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.0%	2	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	2	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.1%	3	0.6%

OCULAR DISORDERS REPORT
CHINESE CRESTED

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 6,741 #	 %	Year Examined: 2018-2022 Total # Dogs: 535 #	 %
LENS Continued				
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES	4	0.1%	2	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT	26	0.4%	3	0.6%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	1	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	28	0.4%	3	0.6%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***274***	***4.1%***	***46***	***8.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	6	0.1%	4	0.7%
110.135 PHPV/ PTVL	2	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	247	3.7%	18	3.4%
110.320 VITREOUS DEGENERATION SYNERESIS	540	8.0%	26	4.9%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	32	0.5%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	6	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	96	1.4%	3	0.6%
120.400 RETINAL HEMORRHAGE	4	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	8	0.1%	0	0.0%
120.960 RETINOPATHY	2	0.0%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	4	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	13	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	8	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	68	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	152	2.3%	2	0.4%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	54	0.8%	25	4.7%
NORMAL				
.000 NORMAL GLOBE	5,699	84.5%	433	80.9%

CHINESE FOO DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Chinese Foo Dog. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Genetic Test Available; No Reference

OCULAR DISORDERS REPORT
CHINESE FOO DOG

There are no statistics available for this breed

CHINESE SHAR-PEI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma – POAG	Autosomal recessive	2,3	NO	Mutation in the *ADAMTS17* gene
B.	Entropion	Not defined	1, 4-7	NO	
C.	Secondary keratitis - chronic	Not defined	1	Breeder option	
D.	Lens luxation	Autosomal recessive	2, 8,9	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

A 6 base pair deletion in exon 22 of *ADAMTS17* has been found in some affected Chinese Shar-Pei. Results supported phenotype is an autosomal recessive trait. A genetic test is available.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

The condition is a particularly severe problem in the Chinese Shar-Pei and is compounded by breeder selection for facial conformation with heavy skin folds which encourages formation of entropion.

C. Secondary keratitis - chronic

A specific designation does not exist on the CAER form for this condition. We ask examiners to mark other – unlisted conditions suspected as inherited. Then in the comments box please write secondary keratitis – chronic.

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. Often associated with entropion or a combination of entropion and ectropion.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may

result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

A 6 base pair deletion in exon 22 of *ADAMTS17* has been found in some affected Chinese Shar-Pei. Results supported phenotype is an autosomal recessive trait. A genetic test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Oliver, JAC, Rustidge S, Pettit L, et al. Evaluation of ADAMTS17 in Chinese Shar-Pei with primary open-angle glaucoma, primary lens luxation, or both. *Am J Vet Res.* 2018 Jan;79(1): 98-106. PMID: 29287154

3. Jeanes EC, Oliver JAC, Ricketts SL, Gould DJ, Mellersh CS. Glaucoma-causing *ADAMTS17* mutations are also reproducibly associated with height in two domestic dog breeds: selection for short stature may have contributed to increased prevalence of glaucoma. Canine Genet Epidemiol. 2019 May 17;6:5. doi: 10.1186/s40575-019-0071-6. PMID: 31131111; PMCID: PMC6524303

4. Lenarduzzi R. Management of eyelid problems in Chinese Shar-Pei puppies. *Vet Med Small Anim Clin*. 1983;78:548-550.

5. Bedford PGC. Entropion in Shar-Peis (Correspondence). *Vet Rec*. 1984;115:666. PMID: 6523717

6. Startup FG. Entropion in the Shar-Pei (Correspondence). *Vet Rec*. 1985;116:57. PMID: 3976141

7. Barnett KC. Inherited eye disease in the dog and cat. *J Small Anim Pract*. 1988;29:462-475.

8. Lazarus JA, Pickett JP, Champagne ES. Primary lens luxation in the Chinese Shar-Pei: clinical and hereditary characteristics. *Vet Ophthalmol*. 1998;1:101-107. PMID: 11397217

9. Gould D, Pettitt L, McLaughlin B, Holmes N, Forman O, Thomas A, Ahonen S, Lohi H, O'Leary C, Sargan D, Mellersh C. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. Vet Ophthalmol. 2011 Nov;14(6):378-84. doi: 10.1111/j.1463-5224.2011.00892.x. Epub 2011 Aug 3. PMID: 22050825.

OCULAR DISORDERS REPORT
CHINESE SHAR-PEI

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	617		119	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	2	0.3%	1	0.8%
10.000	GLAUCOMA	0	0.0%	2	1.7%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	312	50.6%	40	33.6%
22.000	ECTROPION, UNSPECIFIED	12	1.9%	0	0.0%
25.110	DISTICHIASIS	3	0.5%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	2	0.3%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	3	0.5%	0	0.0%
CORNEA					
70.210	PANNUS	29	4.7%	0	0.0%
70.220	PIGMENTARY KERATITIS	11	1.8%	11	9.2%
70.700	CORNEAL DYSTROPHY	4	0.6%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	7	1.1%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	15	2.4%	1	0.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	5	0.8%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.8%	3	2.5%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.3%	4	3.4%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.2%	0	0.0%
93.810	UVEAL MELANOMA	1	0.2%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	4	0.6%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	15	2.4%	1	0.8%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.3%	1	0.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.2%	1	0.8%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.3%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	3	0.5%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.2%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	2	0.3%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	6	1.0%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.2%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.3%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.2%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	2	0.3%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	9	1.5%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***28***	***4.5%***	***2***	***1.7%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.2%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	1	0.2%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	4	0.6%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.2%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2	0.3%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.2%	0	0.0%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.8%
OPTIC NERVE					
130.120	OPTIC NERVE HYPOPLASIA	1	0.2%	0	0.0%

OCULAR DISORDERS REPORT
CHINESE SHAR-PEI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 617 #	%	Year Examined: 2018-2022 Total # Dogs: 119 #	%
OTHER				
900.000 OTHER, UNSPECIFIED	9	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED	17	2.8%	1	0.8%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	21	3.4%	11	9.2%
NORMAL				
.000 NORMAL GLOBE	291	47.2%	64	53.8%

CHINOOK

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes	Not defined	1	Breeder option	
	- iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
D.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	2	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

D. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
CHINOOK

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,535 #	%	2018-2022 251 #	%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.1%	0	0.0%
25.110 DISTICHIASIS	5	0.3%	0	0.0%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.1%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	4	0.3%	2	0.8%
CORNEA				
70.700 CORNEAL DYSTROPHY	2	0.1%	1	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	93	6.1%	3	1.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.1%	1	0.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
93.810 UVEAL MELANOMA	1	0.1%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.1%	1	0.4%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.4%
130.150 OPTIC DISC COLOBOMA	0	0.0%	1	0.4%
LENS				
100.200 CATARACT, UNSPECIFIED	2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	83	5.4%	12	4.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	8	0.5%	4	1.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	3	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	5	0.3%	3	1.2%
100.306 PUNCTATE CATARACT, NUCLEUS	10	0.7%	3	1.2%
100.307 PUNCTATE CATARACT, CAPSULAR	4	0.3%	5	2.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	10	0.7%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	17	1.1%	1	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	8	0.5%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	9	0.6%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	8	0.5%	1	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR	5	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.2%	1	0.4%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES	4	0.3%	4	1.6%
100.330 GENERALIZED/ COMPLETE CATARACT	9	0.6%	1	0.4%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	1	0.4%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***108***	***7.0%***	***20***	***8.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	0.1%	1	0.4%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	18	1.2%	2	0.8%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	64	4.2%	1	0.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
CHINOOK

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,535 #	 %	Year Examined: 2018-2022 Total # Dogs: 251 #	 %
RETINA Continued				
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	19	1.2%	0	0.0%
900.100 OTHER, NOT INHERITED	41	2.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	17	1.1%	10	4.0%
NORMAL				
.000 NORMAL GLOBE	1,284	83.6%	209	83.3%

CHOW CHOW

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Autosomal recessive	2, 3	NO
B.	Entropion	Not defined	1	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- iris to cornea	Not defined	1	NO
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
	- endothelial opacity/no strands	Not defined	1	NO
D.	Cataract	Not defined	1, 4	NO

DESCRIPTION AND COMMENTS

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine screening exam for certification.

Age of onset in the Chow Chow appears to be anywhere between 3-6 years of age and has been observed as a bilateral condition. Gonioscopy has shown extremely narrow iridocorneal angles and in many regions no evidence of trabecular meshwork.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

Entropion in the Chow Chow has been observed for decades and is definitely related to the amount of skin covering the head and face. Because of the conformation admired by both fanciers and the judges, it is doubtful that we will see a significant change in the incidence of entropion as folds are, in many cases, desired by these individuals. Entropion requires surgical correction in the Chow Chow to return comfort and decrease chances for vision loss.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Major PPM's have been observed in the Chow Chow. Many ophthalmologists have observed puppies so severely affected that they are temporarily or permanently blind. The blindness is due to adherence of the membranes to the cornea and/or lens.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Chow Chow, the only reported cataract is congenital. The clinical appearance is variable, ranging from small nuclear or capsular opacities to generalized opacity. The central lens (nucleus) is most consistently affected with variable involvement of the peripheral lens (cortex). Concurrent ocular anomalies may include entropion, microphthalmia, persistent pupillary membranes, and retinal folds, although any direct relationship of these latter conditions to the cataract is unclear.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111. PMID: 14982589

3. Corcaran KA, Koch SA. Primary glaucoma in the Chow chows. *Prog Vet Comp Ophthal*. 1994;4:193-197.

4. Collins BK, Collier LL, Johnson GS, et al. Familial cataracts and concurrent ocular anomalies in chow chows. *J Am Vet Med Assoc*. 1992;200:1485-1491. PMID:1612983

OCULAR DISORDERS REPORT
CHOW CHOW

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,427 #	%	2018-2022 245 #	%
GLOBE				
.110 MICROPHTHALMIA	4	0.3%	1	0.4%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	3	0.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	380	26.6%	50	20.4%
22.000 ECTROPION, UNSPECIFIED	25	1.8%	5	2.0%
25.110 DISTICHIASIS	9	0.6%	1	0.4%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	2	0.1%	0	0.0%
CORNEA				
70.210 PANNUS	9	0.6%	0	0.0%
70.220 PIGMENTARY KERATITIS	26	1.8%	3	1.2%
70.700 CORNEAL DYSTROPHY	8	0.6%	1	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	17	1.2%	0	0.0%
UVEA				
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	5	0.4%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	0	0.0%	1	0.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	497	34.8%	73	29.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	17	1.2%	2	0.8%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	60	4.2%	8	3.3%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	8	0.6%	1	0.4%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	16	1.1%	11	4.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.3%	12	4.9%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	31	2.2%	4	1.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.1%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	5	0.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.1%	2	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	5	0.4%	1	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	9	0.6%	1	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	1	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS	4	0.3%	2	0.8%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	2	0.8%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.1%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES	2	0.1%	1	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***37***	***2.6%***	***10***	***4.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	5	0.4%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	3	0.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	0.1%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	8	0.6%	0	0.0%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
CHOW CHOW

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 1,427 #	 %	Year Examined: 2018-2022 Total # Dogs: 245 #	 %
OTHER					
900.000	OTHER, UNSPECIFIED	17	1.2%	0	0.0%
900.100	OTHER, NOT INHERITED	22	1.5%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	24	1.7%	8	3.3%
NORMAL					
.000	NORMAL GLOBE	642	45.0%	109	44.5%

CIRNECO DELL'ETNA

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CIRNECO DELL'ETNA breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
CIRNECO DELL ETNA

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 42 #	 %	Year Examined: 2018-2022 Total # Dogs: 56 #	 %
EYELIDS					
25.110	DISTICHIASIS	1	2.4%	3	5.4%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	2	3.6%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	3	5.4%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.8%	2	3.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	2.4%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	1.8%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	2.4%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***2***	***4.8%***	***1***	***1.8%***
OPTIC NERVE					
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	1	1.8%
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	2.4%	1	1.8%
NORMAL					
.000	NORMAL GLOBE	38	90.5%	45	80.4%

CLUMBER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1, 2	Breeder option
B.	Ectropion	Not defined	1	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Keratoconjunctivitis sicca	Not defined	1	NO
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
F.	Cataract	Not defined	1	NO
G.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comments

A. Entropion

A conformational defect resulting in "in-rolling" of one or both of the eyelids, which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Keratoconjunctivitis sicca (KCS)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract*. 1963;4:447-456.

OCULAR DISORDERS REPORT
CLUMBER SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,795 #	 %	2018-2022 329 #	 %
GLOBE				
.110 MICROPHTHALMIA	6	0.2%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	3	0.9%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	167	6.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	603	21.6%	73	22.2%
22.000 ECTROPION, UNSPECIFIED	444	15.9%	47	14.3%
25.110 DISTICHIASIS	206	7.4%	41	12.5%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	5	0.2%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	18	0.6%	3	0.9%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	13	0.5%	0	0.0%
70.220 PIGMENTARY KERATITIS	11	0.4%	1	0.3%
70.700 CORNEAL DYSTROPHY	5	0.2%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	0	0.0%	1	0.3%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	69	2.5%	1	0.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	0.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.1%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	2	0.1%	0	0.0%
97.120 COLOBOMA	3	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	6	1.8%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.3%
LENS				
100.200 CATARACT, UNSPECIFIED	15	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	89	3.2%	19	5.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	21	0.8%	11	3.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	29	1.0%	2	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.2%	2	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	17	0.6%	2	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS	7	0.3%	2	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.0%	3	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	15	0.5%	4	1.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	42	1.5%	8	2.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.3%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	16	0.6%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	9	0.3%	1	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR	5	0.2%	1	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	2	0.6%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	2	0.6%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%

OCULAR DISORDERS REPORT
CLUMBER SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,795 #	 %	Year Examined: 2018-2022 Total # Dogs: 329 #	 %
LENS Continued				
100.328 Y-SUTURE TIP OPACITIES	4	0.1%	2	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT	5	0.2%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***201***	***7.2%***	***41***	***12.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	6	0.2%	1	0.3%
110.135 PHPV/ PTVL	3	0.1%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	182	6.5%	2	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	9	0.3%	1	0.3%
120.190 RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.3%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	15	0.5%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	1	0.0%	0	0.0%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	2	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	25	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	64	2.3%	1	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	32	1.1%	7	2.1%
NORMAL				
.000 NORMAL GLOBE	1,480	53.0%	159	48.3%

COCKER SPANIEL

(*American)

*The official breed name is Cocker Spaniel. The designation "American" has been used to avoid confusion and emphasize the distinction from the English Cocker Spaniel breed.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Keratoconjunctivitis sicca	Not defined	1, 2	NO	
B.	Glaucoma	Not defined	3, 4	NO	
C.	Ectropion	Not defined	1	Breeder option	
D.	Distichiasis	Not defined	1, 2, 5, 15	Breeder option	
E.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
F.	Prolapsed gland of the third eyelid	Not defined	6	Breeder option	
G.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
H.	Keratitis	Not defined	1	Passes with no notation	
I.	Cataract	Not defined	1, 2, 7-10	NO	
J.	Retinal atrophy (*prcd*)	Autosomal recessive	1, 11-13	NO	Mutation in the *prcd* gene
K.	Retinal dysplasia				
	- folds	Not defined	1, 14	Breeder option	

Description and Comments

A. Keratoconjunctivitis sicca

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

B. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

C. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

D. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

E. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct adjacent to the eye. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

F. Prolapsed gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye."

G. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

H. Keratitis

A specific designation does not exist on the CAER form for this condition. We ask examiners to mark other – unlisted conditions suspected as inherited. Then in the comments box please write “keratitis”.

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. Often associated with entropion or a combination of entropion and ectropion.

I. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In this breed, the onset of cataract may occur at an early age (less than 2 years) with rapid progression to maturity and associated with significant lens-induced inflammation.

J. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Cocker Spaniel is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

K. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Williams LW, Peiffer RL, Gelatt KN, et al. A survey of ocular findings in the American cocker spaniel. J Am Anim Hosp Assoc. 1979;15:603-607.

3. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. Vet Ophthalmol. 2004;7:97-111. PMID: 14982589

4. Lovekin LG, Bellhorn RW. Clinicopathologic changes in primary glaucoma in the Cocker Spaniel. Am J Vet Res. 1968;29:379-385.

5. Lavach JD. Diseases of the eyelids (Part II). Comp Cont Educ Pract Vet. 1979;1:485-492.

6. Morgan RV, Duddy JM, McClurg K. Prolapse of the third eyelid in the dog: A retrospective study of 89 cases (1980-1990). J Am Anim Hosp Assoc. 1993;29:56-60.

7. Gelatt KN, Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. Vet Ophthalmol. 2005;8:101-111. PMID: 15762923

8. Olesen HP, Jensen OA, Norn MS. Congenital hereditary cataract in Cocker Spaniels. J Small Anim Pract. 1974;15:741-750. PMID: 4449208

9. Yakely WL. A study of heritability of cataracts in the American Cocker Spaniel. J Am Vet Med Assoc. 1978;172:814-817. PMID: 632194

10. Barnett KC. Comparative aspects of canine hereditary eye disease. Adv Vet Sci Comp Med. 1976;20:39-67. PMID: 827198

11. Barnett KC. Canine retinopathies III. The other breeds. J Small Anim Pract. 1965;6:185-196.

12. Aguirre GD, Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. Exp Eye Res. 1988;46:663-687. PMID: 3164273

13. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. Genomics. 2006;88:551-563. PMID: 16938425

14. MacMillan AD, Lipton DE. Heritability of multifocal retinal dysplasia in American Cocker Spaniels. J Am Vet Med Assoc. 1978;172:568-572. PMID: 632194

15. ECVO 2021 abstract: Jondeau C, Gounon M, Bourguet A, Chahory S. "Epidemiology and Clinical Significance of Canine Distichiasis: A Retrospective Study of 291 Cases". PMID: 35285574.

OCULAR DISORDERS REPORT
COCKER SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 59,903 #	 %	Year Examined: 2018-2022 Total # Dogs: 6,215 #	 %
GLOBE				
.110 MICROPHTHALMIA	35	0.1%	6	0.1%
10.000 GLAUCOMA	36	0.1%	7	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	34	0.5%
EYELIDS				
20.110 EYELID DERMOID	2	0.0%	0	0.0%
20.140 ECTOPIC CILIA	56	0.1%	1	0.0%
20.160 MACROPALPEBRAL FISSURE	179	0.3%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	159	0.3%	12	0.2%
22.000 ECTROPION, UNSPECIFIED	996	1.7%	27	0.4%
25.110 DISTICHIASIS	30,111	50.3%	3,069	49.4%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	123	2.0%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	559	0.9%	155	2.5%
40.910 KERATOCONJUNCTIVITIS SICCA	384	0.6%	53	0.9%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	0	0.0%	3	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY	8	0.0%	2	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	228	0.4%	28	0.5%
CORNEA				
70.210 PANNUS	498	0.8%	0	0.0%
70.220 PIGMENTARY KERATITIS	542	0.9%	121	1.9%
70.700 CORNEAL DYSTROPHY	1,648	2.8%	137	2.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	42	0.1%	1	0.0%
UVEA				
90.250 PIGMENTARY UVEITIS	1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA	3	0.0%	1	0.0%
93.120 IRIS CYST	22	0.0%	1	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	2	0.0%	0	0.0%
93.150 IRIS COLOBOMA	9	0.0%	1	0.0%
93.170 ANTERIOR CHAMBER CYST	0	0.0%	1	0.0%
93.180 IIRIS SPHINCTER DYSPLASIA	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	174	0.3%	25	0.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	32	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	35	0.1%	1	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	28	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	47	0.1%	38	0.6%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	6	0.0%	2	0.0%
93.810 UVEAL MELANOMA	1	0.0%	0	0.0%
95.120 CILIARY BODY CYST	1	0.0%	1	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	6	0.0%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	33	0.1%	0	0.0%
97.120 COLOBOMA	14	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	85	1.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	3	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.0%
120.960 RETINOPATHY	0	0.0%	7	0.1%
120.970 CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.0%
130.110 MICROPAPILLA	0	0.0%	1	0.0%
130.150 OPTIC DISC COLOBOMA	0	0.0%	3	0.0%

OCULAR DISORDERS REPORT
COCKER SPANIEL

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 59,903 #	 %	Year Examined: 2018-2022 Total # Dogs: 6,215 #	 %
LENS					
100.200	CATARACT, UNSPECIFIED	1,023	1.7%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3,567	6.0%	393	6.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1,246	2.1%	272	4.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	613	1.0%	71	1.1%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	179	0.3%	42	0.7%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	188	0.3%	35	0.6%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	262	0.4%	86	1.4%
100.306	PUNCTATE CATARACT, NUCLEUS	106	0.2%	16	0.3%
100.307	PUNCTATE CATARACT, CAPSULAR	137	0.2%	45	0.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1,126	1.9%	112	1.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1,275	2.1%	116	1.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	342	0.6%	47	0.8%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	115	0.2%	5	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	193	0.3%	23	0.4%
100.316	INCIPIENT CATARACT, NUCLEUS	211	0.4%	22	0.4%
100.317	INCIPIENT CATARACT, CAPSULAR	99	0.2%	22	0.4%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	84	0.1%	43	0.7%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	82	0.1%	55	0.9%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	16	0.0%	11	0.2%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	2	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	5	0.0%	1	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	22	0.0%	15	0.2%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.0%	3	0.0%
100.328	Y-SUTURE TIP OPACITIES	50	0.1%	61	1.0%
100.330	GENERALIZED/ COMPLETE CATARACT	1,043	1.7%	40	0.6%
100.340	RESORBING/ HYPERMATURE CATARACT	27	0.0%	19	0.3%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	83	0.1%	10	0.2%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***8,397***	***14.0%***	***1,103***	***17.7%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	43	0.1%	15	0.2%
110.135	PHPV/ PTVL	9	0.0%	1	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	23	0.0%	2	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	144	0.2%	11	0.2%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	6,957	11.6%	166	2.7%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	171	0.3%	4	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	9	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	466	0.8%	8	0.1%
120.400	RETINAL HEMORRHAGE	7	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	14	0.0%	0	0.0%
120.960	RETINOPATHY	34	0.1%	11	0.2%
OPTIC NERVE					
130.110	MICROPAPILLA	4	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	10	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	113	0.2%	1	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	451	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	1,066	1.8%	20	0.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,024	1.7%	297	4.8%
NORMAL					
.000	NORMAL GLOBE	24,474	40.9%	2,247	36.2%

COLLIE

(Rough and Smooth varieties)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia	Not defined	1, 2	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to lens	Not defined	1	NO	
E.	Cataract	Not defined	1	NO	
F.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- Rod/cone dysplasia type 2- (*rcd2*)	Autosomal recessive	3-6	NO	Mutation in the *RD3* gene
H.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
I.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Autosomal recessive	1, 7-31	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Microphthalmia

Microphthalmia is a congenital defect characterized by a small eye often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina. An association has been made between partial albinism, multiple ocular defects (especially microphthalmia) and deafness in a number of

canine breeds including the Collie. From these reports it appears that a predominantly white hair coat is associated with a higher incidence of ocular defects.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. In the Collie, because there is significant clinical disease associated with the abnormal hairs, breeding of affected animals should be discouraged.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Collie, this is a particularly serious problem noted frequently on routine screening examination. The majority of persistent pupillary membranes identified on routine screening examinations include iris sheets, and bridging from the iris to cornea and the iris to lens. These may result in vision impairment.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

G. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds. In the Collie, the rod/cone degeneration occurs very rarely and in those cases has not been caused by any of the known genetic mutations.

- Rod-cone dysplasia type 2- (*rcd2*)

An inherited retinal disease characterized by abortive or abnormal development of rods and cones. The disease can be detected histologically by 6 weeks. Clinical night blindness is observed as early as 6 weeks with total blindness by 1 year of age. It may be diagnosed as early as 24 days with an ERG. Histologically the disease can be detected by 6 weeks. This form of retinal dysplasia is clinically similar to, but genetically distinct from that seen in the Irish Setter. This condition is caused by an insertion in *RD3.* A DNA test is available.

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

I. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

Historical Note:

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gwin RM, Wyman M, Lim DJ, et al. Multiple ocular defects associated with partial albinism and deafness in the dog. *J Am Anim Hosp Assoc*. 1981;17:401-408.

3. Kukekova AV, Goldstein O, Johnson JL, et al. Canine RD3 mutation establishes rod-cone dysplasia type 2 (rcd2) as ortholog of human and murine rd3. *Mamm Genome*. 2009;20:109-123. PMID: 19130129

4. Santos-Anderson RM, Tso MOM, Wolf ED. An inherited retinopathy in Collies. *Invest Ophthalmol*

Vis Sci. 1980;11:1281-1294. PMID: 7429765

5. Wolf ED, Vainisi SJ, Santos-Anderson RM. Rod-cone dysplasia in the Collie. *J Am Vet Med Assoc*. 1978;173:1331-1333. PMID: 730609

6. Woodford BJ, Liu Y, Fletcher RT, et al. Cyclic nucleotide metabolism in inherited retinopathy in Collies: a biochemical and histochemical study. *Exp Eye Res*. 1982;34:703-714. PMID: 6282610

7. Magrane W. Congenital anomaly of the optic nerve in Collies. *North Am Vet*. 1953;34:646-647.

8. Roberts SR. Congenital posterior ectasia of the sclera in Collie dogs. *Am J Ophthalmol*. 1960;50:451-465. PMID: 14437837

9. Donovan EF, Wyman M. Ocular fundus anomaly in the Collie. *J Am Vet Med Assoc*. 1965;147:1465-1469. PMID: 5884039

10. Roberts SR, Dellaporta A. Congenital posterior ectasia of the sclera in Collie dogs. I. Clinical features. *Am J Ophthalmol*. 1965;59:180-186. PMID: 14268789

11. Freeman HM, Donovan RD, Schepens CL. Retinal detachment, chorioretinal changes and staphyloma in the Collie. I. Ophthalmoscopic findings. *Arch Ophthalmol*. 1966;76:412-421. PMID: 5949871

12. Roberts SR, Dellaporta A, Winter FC. The Collie ectasia syndrome. Pathology of eyes of young and adult dogs. *Am J Ophthalmol*. 1966;62:728-752. PMID: 4959239

13. Roberts SR, Delaporta A, Winter FC. The Collie ectasia syndrome. Pathologic alterations in eyes of pups one to fourteen days of age. *Am J Ophthalmol*. 1966;61:1458-1465. PMID: 5949333

14. Roberts SR. Color dilution and hereditary defects in Collie dogs. *Am J Ophthalmol*. 1967;63:1762-1775. PMID: 4961230

15. Yakely WL, Wyman M, Donovan EF, et al. Genetic transmission of an ocular fundus anomaly in Collies. *J Am Vet Med Assoc*. 1968;152:457-461. PMID: 5688944

16. Donovan RH, Freeman HM, Schepens CL. Anomaly of the Collie eye. *J Am Vet Med Assoc*. 1969;155:872-877. PMID: 4980213

17. Freeman HM, Donovan RH, Schepens CL. Chorioretinal changes, juxtapapillary staphyloma and retinal detachment in the Collie. *Bibl Ophthalmol*. 1969;79:111-117. PMID: 5346730

18. Latshaw WK, Wyman M, Venzke NG. Embryologic development of an anomaly of ocular fundus in the Collie dog. *Am J Vet Res*. 1969;30:211-217. PMID: 5392979

19. Roberts SR. The Collie eye anomaly. *J Am Vet Med Assoc*. 1969;155:859-864. PMID: 4980208

20. Wyman M, Donovan EF. Eye anomaly of the Collie. *J Am Vet Med Assoc*. 1969;155:866-870. PMID: 4980211

21. Blogg JR. Collie eye anomaly. *Aust Vet J*. 1970;46:530-532. PMID: 4992161

22. Bjerkas E. Collie eye anomaly in the rough collie in Norway. *J Small Anim Pract*. 1991;32:89-92.

23. Yakely WL. Collie eye anomaly: decreased prevalence through selective breeding. *J Am Vet Med Assoc*. 1972;161:1103-1107. PMID: 4631461

24. Barnett KC. Collie eye anomaly (CEA). *J Small Anim Pract*. 1979;20:537-542. PMID: 480920

25. Brown GC, Shields JA, Patty BE, et al. Congenital pits of the optic nerve head. I. Experimental studies in Collie dogs. *Arch Ophthalmol*. 1979;97:1341-1344. PMID: 454276

26. Bedford PGC. Collie eye anomaly in the United Kingdom. *Vet Rec*. 1982;111:263-270. PMID: 7147637

27. Stades FC, Barnett KC. Collie eye anomaly in Collies in the Netherlands. *Vet Q*. 1981;3:66-73. PMID: 6787732

28. Vainisi SJ, Peyman GA, Wolf ED, et al. Treatment of serous retinal detachments associated with optic disk pits in dogs. *J Am Vet Med Assoc*. 1989;195:1233-1236. PMID: 2584121

29. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for Collie eye anomaly. *Genomics*. 2003;82:86-95. PMID: 12809679

30. Wallin-Hakansson B, Wallin-Hakansson N, Hedhammar A. Influence of selective breeding on prevalence of chorioretinal dysplasia and coloboma in the Rough Collie in Sweden. *J Small Anim Pract*. 2000;41:56-59. PMID:10701187 **reference derived from non-USA dog population**

31. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res*. 2007;17:1562-1571. PMID: 17916641

OCULAR DISORDERS REPORT
COLLIE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 59,304 #	 %	2018-2022 8,224 #	 %
GLOBE				
.110 MICROPHTHALMIA	974	1.6%	280	3.4%
10.000 GLAUCOMA	7	0.0%	0	0.0%
EYELIDS				
20.110 EYELID DERMOID	1	0.0%	0	0.0%
20.140 ECTOPIC CILIA	5	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	57	0.1%	4	0.0%
22.000 ECTROPION, UNSPECIFIED	8	0.0%	0	0.0%
25.110 DISTICHIASIS	1,107	1.9%	138	1.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.0%
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32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	9	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	5	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	13	0.0%	1	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	2	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	3	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	7	0.0%	1	0.0%
70.700 CORNEAL DYSTROPHY	411	0.7%	16	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	12	0.0%	0	0.0%
UVEA				
90.250 PIGMENTARY UVEITIS	1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA	5	0.0%	3	0.0%
93.120 IRIS CYST	19	0.0%	11	0.1%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150 IRIS COLOBOMA	24	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	4	0.0%	8	0.1%
93.180 IIRIS SPHINCTER DYSPLASIA	2	0.0%	2	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	9,988	16.8%	1,973	24.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	514	0.9%	99	1.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	128	0.2%	14	0.2%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	65	0.1%	9	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	45	0.1%	16	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	12	0.0%	2	0.0%
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95.120 CILIARY BODY CYST	1	0.0%	2	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	306	0.5%	215	2.6%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	40,753	68.7%	6,252	76.0%
97.120 COLOBOMA	2,298	3.9%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	231	2.8%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	0	0.0%	8	0.1%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	32	0.4%
120.970 CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.0%
130.110 MICROPAPILLA	0	0.0%	30	0.4%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	10	0.1%
130.150 OPTIC DISC COLOBOMA	0	0.0%	299	3.6%
LENS				
100.200 CATARACT, UNSPECIFIED	114	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	587	1.0%	90	1.1%

OCULAR DISORDERS REPORT
COLLIE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 59,304 #	 %	2018-2022 8,224 #	 %
LENS Continued				
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	107	0.2%	15	0.2%
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100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	26	0.0%	5	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS	217	0.4%	58	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR	49	0.1%	14	0.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	105	0.2%	13	0.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	113	0.2%	13	0.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	39	0.1%	5	0.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	39	0.1%	4	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	28	0.0%	3	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	159	0.3%	47	0.6%
100.317 INCIPIENT CATARACT, CAPSULAR	34	0.1%	8	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	5	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	5	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	9	0.0%	2	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	5	0.0%	2	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	49	0.1%	1	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	8	0.0%	1	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,156***	***1.9%***	***206***	***2.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	394	0.7%	54	0.7%
110.135 PHPV/ PTVL	51	0.1%	3	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	46	0.1%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	4,068	6.9%	370	4.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	58	0.1%	4	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	105	0.2%	11	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	814	1.4%	1	0.0%
120.400 RETINAL HEMORRHAGE	105	0.2%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	823	1.4%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	121	0.2%	55	0.7%
120.960 RETINOPATHY	1	0.0%	2	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	160	0.3%	22	0.3%
130.120 OPTIC NERVE HYPOPLASIA	252	0.4%	16	0.2%
130.150 OPTIC DISC COLOBOMA	4,727	8.0%	409	5.0%
OTHER				
900.000 OTHER, UNSPECIFIED	132	0.2%	0	0.0%
900.100 OTHER, NOT INHERITED	297	0.5%	10	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	631	1.1%	31	0.4%
NORMAL				
.000 NORMAL GLOBE	14,818	25.0%	1,312	16.0%

COTON DE TULEAR

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
B.	Prolapsed gland of third eyelid	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Y-suture tip opacity	Not defined	1	Breeder option	
G.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
H.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- *prcd*	Not defined	2, 3	NO	Mutation in the *prcd* gene
I.	Multifocal retinopathy - *cmr2*	Autosomal recessive	4, 5	NO (Breeder option with Normal DNA test for CMR)	Mutation in the *BEST1* gene

Description and Comments

A. Imperforate Lacrimal Punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

B. Prolapse of the gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated and severe chronic inflammation or keratoconjunctivitis

sicca/dry eye syndrome may ensue. Commonly referred to as "cherry eye."

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPMs)

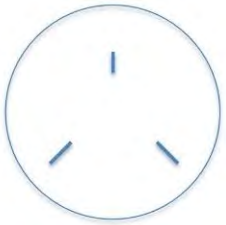
Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

G. Vitreous degeneration - syneresis

Liquefaction of the vitreous gel which may predispose to retinal detachment.

H. Retinal atrophy

- generalized

An umbrella term used to describe a group of inherited dysplastic, dystrophic, or degenerative diseases of the retinal visual cells (photoreceptors, retinal pigment epithelium, or both).

- *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Coton de Tulear is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

I. Multifocal retinopathy – *cmr2*

Canine Multifocal Retinopathy type 2 (*cmr2*) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There is typically a serous sub-retinal fluid in the Coton de Tulear, although there may be accumulation of sub-retinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 15 weeks to 1 year of age. The lesions typically remain static in size and color beyond 1 year of age. The bullae appear to gradually lose the serous sub-retinal fluid after 4-5 years of age. Discrete areas of tapetal hyper-reflectivity might also be seen. Most dogs exhibit no noticeable problem with vision despite their abnormal appearing retinas. Electroretinograms reveal significant differences in photopic flickers in affected dogs.

Canine Multifocal Retinopathy type 2 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Coton du Tulear. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

3. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS

Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

4. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007;48:1959-1967. PMID: 17460247

5. Grahn BH, Sandmeyer LL, Breaux C. Retinopathy of Coton de Tulear dogs: clinical manifestations, electroretinographic, ultrasonographic, fluorescein and indocyanine green angiographic, and optical coherence tomographic findings. *Vet Ophthalmol*. 2008;11:242-249. PMID: 18638350

OCULAR DISORDERS REPORT
COTON DE TULEAR

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	5,399		635	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	4	0.1%	2	0.3%
25.110	DISTICHIASIS	46	0.9%	4	0.6%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	3	0.5%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	4	0.1%	7	1.1%
40.910	KERATOCONJUNCTIVITIS SICCA	2	0.0%	0	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	19	0.4%	5	0.8%
CORNEA					
70.220	PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	58	1.1%	4	0.6%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	2	0.0%	0	0.0%
93.120	IRIS CYST	4	0.1%	0	0.0%
93.150	IRIS COLOBOMA	2	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	457	8.5%	70	11.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	8	0.1%	1	0.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.0%	2	0.3%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	8	0.1%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	1	0.0%	1	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.2%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	190	3.5%	32	5.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	15	0.3%	4	0.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	7	0.1%	4	0.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	5	0.1%	5	0.8%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	26	0.5%	2	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.1%	1	0.2%
100.307	PUNCTATE CATARACT, CAPSULAR	20	0.4%	9	1.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	15	0.3%	4	0.6%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	18	0.3%	2	0.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	10	0.2%	2	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	7	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	6	0.1%	2	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	7	0.1%	4	0.6%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.2%
100.328	Y-SUTURE TIP OPACITIES	19	0.4%	14	2.2%
100.330	GENERALIZED/ COMPLETE CATARACT	7	0.1%	1	0.2%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%

OCULAR DISORDERS REPORT
COTON DE TULEAR

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 5,399 #	 %	2018-2022 635 #	 %
LENS Continued				
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***157***	***2.9%***	***41***	***6.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	8	0.1%	1	0.2%
110.135 PHPV/ PTVL	1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	6	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	48	0.9%	6	0.9%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	21	0.4%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	11	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	3	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	34	0.6%	2	0.3%
120.370 MULTIFOCAL RETINOPATHY	2	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	1	0.0%	3	0.5%
OPTIC NERVE				
130.110 MICROPAPILLA	3	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	2	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	44	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	152	2.8%	2	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	68	1.3%	26	4.1%
NORMAL				
.000 NORMAL GLOBE	4,588	85.0%	479	75.4%

CURLY-COATED RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1, 2	NO
D.	Y-suture tip opacity	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membrane (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

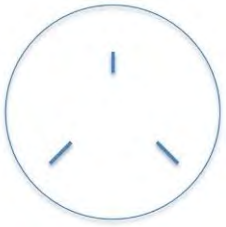
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.
In the Curly-Coated Retriever the following cataracts have been reported:

1. Anterior cortical subcapsular cataract: Anterior subcapsular striate cortical cataracts usually occur bilaterally, slowly progress and usually occur between 5-8 years of age.

2. Posterior subcapsular cataract: Posterior polar subcapsular opacities occur at 2-4 years of age and progress slowly.

D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med.* 1976;20:39-67. PMID: 827198

OCULAR DISORDERS REPORT
CURLY-COATED RETRIEVER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,993		196	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.1%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	4	0.2%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	11	0.6%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	3	0.2%	0	0.0%
25.110	DISTICHIASIS	152	7.6%	16	8.2%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	3	0.2%	1	0.5%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	14	0.7%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
UVEA					
90.250	PIGMENTARY UVEITIS	1	0.1%	0	0.0%
93.120	IRIS CYST	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	77	3.9%	9	4.6%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	4	0.2%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.3%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	17	0.9%	10	5.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	13	0.7%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.5%
120.960	RETINOPATHY	0	0.0%	1	0.5%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.5%
LENS					
100.200	CATARACT, UNSPECIFIED	19	1.0%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	122	6.1%	22	11.2%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	18	0.9%	2	1.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	17	0.9%	4	2.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.2%	3	1.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.5%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	29	1.5%	10	5.1%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.1%	4	2.0%
100.307	PUNCTATE CATARACT, CAPSULAR	15	0.8%	2	1.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	12	0.6%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	13	0.7%	2	1.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	11	0.6%	1	0.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	1	0.5%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	7	0.4%	1	0.5%
100.316	INCIPIENT CATARACT, NUCLEUS	3	0.2%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	3	0.2%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.5%
100.328	Y-SUTURE TIP OPACITIES	15	0.8%	19	9.7%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.2%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***156***	***7.8%***	***32***	***16.3%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	3	0.2%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.2%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	17	0.9%	0	0.0%

OCULAR DISORDERS REPORT
CURLY-COATED RETRIEVER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,993 #	%	Year Examined: 2018-2022 Total # Dogs: 196 #	%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	21	1.1%	1	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	3	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	12	0.6%	0	0.0%
120.960 RETINOPATHY	1	0.1%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	3	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	13	0.7%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	16	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	35	1.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	31	1.6%	13	6.6%
NORMAL				
.000 NORMAL GLOBE	1,581	79.3%	118	60.2%

CZECHOSLOVAKIAN VLCAK

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CZECHOSLOVAKIAN VLCAK breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
CZECHOSLOVAKIAN VLCAK

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 30 #	 %	Year Examined: 2018-2022 Total # Dogs: 68 #	 %
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	6.7%	0	0.0%
UVEA				
93.120 IRIS CYST	1	3.3%	1	1.5%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	2	2.9%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	10.0%	3	4.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	2	2.9%
100.306 PUNCTATE CATARACT, NUCLEUS	1	3.3%	1	1.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	2	2.9%
100.316 INCIPIENT CATARACT, NUCLEUS	2	6.7%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	1.5%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***3***	***10.0%***	***6***	***8.8%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	3.3%	0	0.0%
FUNDUS				
130.110 MICROPAPILLA	0	0.0%	2	2.9%
OPTIC NERVE				
130.110 MICROPAPILLA	1	3.3%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	3.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	6.7%	4	5.9%
NORMAL				
.000 NORMAL GLOBE	32	106.7%	56	82.4%

DACHSHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia and multiple ocular defects	Not defined	2,3	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Superficial punctate keratitis	Not defined	4	Breeder option	
D.	Corneal dystrophy				
	- endothelial	Not defined	5, 6	NO	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
F.	Cataract	Not defined	1	NO	
G.	Retinal atrophy		1	NO	
	- generalized	Not defined	1	NO	
	- CORD1	Autosomal recessive	7-15, 17,18	NO	Mutation in the *RPGRIP* gene in the Miniature Long Haired Dachshund
	- cone-rod dystrophy	Autosomal recessive	16	NO	Mutation in the *NPHP4* gene in the Standard Wire Haired Dachshund
H.	Retinopathy - associated with ceroid lipofuscinosis	Autosomal recessive	19-20	NO	Mutation in the *TPP1* gene
I.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Microphthalmia and multiple ocular anomalies

Microphthalmia is a congenital defect characterized by a small eye often with associated defects of the cornea, anterior chamber, lens and/or retina. An association has been made between partial albinism, multiple ocular defects (especially microphthalmia) and deafness in a number of canine breeds including the Dachshund. From these reports it appears that a predominantly white hair coat is associated with a higher incidence of ocular defects.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Superficial punctate keratitis

Superficial punctate keratitis is characterized by multiple sites of discrete corneal inflammation and/or ulceration and which is suspected to be immune-mediated in etiology. Lesions are typically oval to circular, well-defined and may be associated with an arborizing vascular response.

D. Corneal dystrophy - endothelial

An abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision.

E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal atrophy*

- generalized

An umbrella term used to describe a group of inherited dysplastic, dystrophic, or degenerative diseases of the retinal visual cells (photoreceptors, retinal pigment epithelium, or both).

- CORD1

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram before it is apparent clinically.

In Miniature Dachshunds there is a recessively inherited disorder caused by a 44 base pair insertion in the *RPGRIP1* gene. The insertion presumably truncates the protein and its major C-terminal RPGR binding domain. The resulting disease is called cone-rod dystrophy 1 (CORD1) as the salient clinical abnormalities are a cone ERG dysfunction which does not correlate with photopic vision defects. The onset of the disease is variable, and is influenced by a second modifier locus which also is located on canine chromosome 15. Dogs homozygous for both defects have retinal abnormalities on ophthalmoscopy before 1-2 years of age. Dogs homozygous only for the *RPGRIP* insertion may have a late onset (>6 years) retinal degeneration diagnosed by ophthalmoscopy. Although the *RPGRIP1* molecular defect can be identified by means of a DNA test, questions have been raised about its validity given the poor genotype-phenotype correlation. A DNA test is available.

In a previous study using an inbred research colony, a 44-nucleotide insertion (ins44) in exon 2 of RPGRIP1 was associated with retinal degeneration. Despite concordance of ins44 with retinal degeneration, evidence indicate that there was phenotype-genotype discordance within the miniature long-haired dachshunds that were not directly related to the experimental colony as not all dogs that were homozygous for ins44 were developing early onset retinal degeneration, but were developing retinal degeneration at a much later stage or not at all. In this investigation MAP9 deletion associated with early retinal degeneration onset was identified. Given the new genome assembly, the nominal title is CanFam3.1MAP9 corrected. Deletion was confirmed in early onset retinal degeneration cases and not late onset retinal degeneration cases, there is a variable age of onset and demonstrate the interaction of two independent loci that contribute to the phenotype. This study has shown that RPGRIP1 ins44/ins44 dogs with early onset retinal degeneration has several polymorphisms in MAP9, some of them potentially harmful, when compared with MAP9 in late onset retinal degeneration dogs. Detection of the presence or absence of MAP early onset retinal degeneration by qPCR can be used to specify early onset or late onset status for ins44 homozygotes. The story, however, is not as straightforward as suggested by the Forman et al. 2016 paper. Unpublished work by K. Miyadera and G. Aguirre in a research colony in which one of the founders originated from a MLHD at the Animal Health Trust finds that dogs that are homozygous for the RPGRIP1 ins 44 and the newly identified MAP9 deletion still do not show early-onset retinal degeneration. This suggests that there probably is a third genetic locus that interacts with MAP9 and RPGRIP1 in determining the age of disease onset and severity of the phenotype. Regardless, the identification of the MAP9 deletion is a major finding that will help unravel the complex genetics of this retinal disorder.

- NPHP4

This is an early onset cone-rod dystrophy with disease onset documented between 10 months to 3 years of age, with complete retinal atrophy noted by 6 years of age in affected animals. On ERG, cone dysfunction can be noted as early as 5 weeks of age.

** note these forms of retinal degeneration are clinically indistinguishable from other forms of PRA, and can only be differentiated by genetic test or functional studies.

H. Retinopathy associated with ceroid lipufuscinosis

Progressive, multifocal serous retinal detachments first appear in Longhaired Dachshunds with late infantile neuronal ceroid lipofuscinosis at age 5-10 months. Late infantile ceroid neuronal lipofuscinosis in Miniature Dachshunds is a fatal, autosomal recessive, inherited lysosomal storage disease characterized by progressive neurodegeneration. The disease results from a defect in the *TPP1* (Tripeptidyl peptidase) gene. Inheritance of the retinopathy is linked to the gene causing late infantile neuronal ceroid lipofuscinosis.

I. Retinal dysplasia – folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and the more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Sorsby A, Davey JB. Ocular Associations of Dappling (or Merling) in the Coat Colour of Dogs .1. Clinical and Genetical Data. *J Genet*. 1954;52:425-440.

3. Dausch D, Wegner W, Michaelis M, et al. [Ophthalmological findings in Merle Dachshunds]. *Dtsch Tierarztl Wochenschr*. 1977;84:468-475. Ophthalmologische Befunde in einer Merlezucht.

4. Andrew, S. E. (2008). "Immune-mediated canine and feline keratitis." Vet Clin North Am Small Anim Pract 38(2): 269-290, vi. PMID: 18299007

5. Cooley PL, Dice PF, 2nd. Corneal dystrophy in the dog and cat. *Vet Clin North Am Small Anim Pract*. 1990;20:681-692. PMID: 2194353

6. Martin CL, Dice PF. Corneal endothelial dystrophy in the dog. *J Am Anim Hosp Assoc*. 1982;18:327.

7. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex. *Am J Vet Res*. 1974;35:571-574.

8. Curtis R, Barnett KC. Progressive retinal atrophy in miniature longhaired Dachshund dogs. *Br Vet J*. 1993;149:71-85. PMID: 8439801

9. Mellersh CS, Boursnell ME, Pettitt L, et al. Canine RPGRIP1 mutation establishes cone-rod dystrophy in miniature longhaired Dachshunds as a homologue of human Leber congenital amaurosis. *Genomics*. 2006;88:293-301. PMID: 16806805

10. Ropstad EO, Bjerkas E, Narfstrom K. Clinical findings in early onset cone-rod dystrophy in the Standard Wire-haired Dachshund. *Vet Ophthalmol*. 2007;10:69-75. PMID: 17324160

11. Turney C, Chong NH, Alexander RA, et al. Pathological and electrophysiological features of a canine cone-rod dystrophy in the miniature longhaired Dachshund. *Invest Ophthalmol Vis Sci*. 2007;48:4240-4249. PMID: 17724213

12. Ropstad EO, Narfstrom K, Lingaas F, et al. Functional and structural changes in the retina of wire-haired Dachshunds with early-onset cone-rod dystrophy. *Invest Ophthalmol Vis Sci*. 2008;49:1106-1115. PMID: 18326738

13. Miyadera K, Kato K, Aguirre-Hernandez J, et al. Phenotypic variation and genotype-phenotype discordance in canine cone-rod dystrophy with an RPGRIP1 mutation. *Mol Vis*. 2009;15:2287-2305. PMID: 19936303

14. Miyadera K, Kato K, Boursnell M, et al. Genome-wide association study in RPGRIP1$^{-/-}$ dogs identifies a modifier locus that determines the onset of retinal degeneration. (Special Issue: Advances in the canine system for genetic studies.). *Mamm Genome*. 2012;23:212-223. PMID: 22193413

15. Kuznetsova T, Iwabe S, Boesze-Battaglia K, et al. Exclusion of RPGRIP1 ins44 from primary causal association with early-onset cone-rod dystrophy in dogs. *Invest Ophthalmol Vis Sci*. 2012;53:5486-5501. PMID: 22807295

16. Wiik AC, Wade C, Biagi T, et al. A deletion in nephronophthisis 4 (NPHP4) is associated with recessive cone-rod dystrophy in standard wire-haired Dachshund. *Genome Res*. 2008;18:1415-1421. PMID: 18687878

17. Wiik AC, Thoresen SI, Wade C, et al. A population study of a mutation allele associated with cone-rod dystrophy in the standard wire-haired Dachshund. *Anim Genet*. 2009;40:572-574. PMID: 19392817

18. Zhang Q, Acland GM, Parshall CJ, et al. Characterization of canine photoreceptor phosducin cDNA and identification of a sequence variant in dogs with photoreceptor dysplasia. *Gene*. 1998;215:231-239. PMID: 9714819

19. Whiting RH, Pearce JW, Castaner LJ, et al. Multifocal retinopathy in Dachshunds with CLN2 neuronal ceroid lipofuscinosis. Experimental Eye Research 2015 134: 123-132. PMID: 25697710

20. Awano T, Katz ML, O'Brien DP, et al. A frame shift mutation in canine TPP1 (the ortholog of human CLN2)

in a juvenile Dachshund with neuronal ceroid lipofuscinosis. *Mol Genet Metab*. 2006;89:254-260. PMID: 16621647

OCULAR DISORDERS REPORT
DACHSHUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	6,683		2,037	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	24	0.4%	0	0.0%
10.000	GLAUCOMA	2	0.0%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	7	0.1%	2	0.1%
25.110	DISTICHIASIS	421	6.3%	186	9.1%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	3	0.1%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.0%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	5	0.1%	0	0.0%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	1	0.0%	0	0.0%
51.100	THIRD EYELID CARTILAGE ANOMALY	2	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	9	0.1%	3	0.1%
CORNEA					
70.210	PANNUS	3	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	0	0.0%	1	0.0%
70.700	CORNEAL DYSTROPHY	34	0.5%	2	0.1%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	9	0.1%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	9	0.1%	8	0.4%
93.120	IRIS CYST	4	0.1%	0	0.0%
93.150	IRIS COLOBOMA	25	0.4%	2	0.1%
93.180	IIRIS SPHINCTER DYSPLASIA	0	0.0%	2	0.1%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	283	4.2%	101	5.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	26	0.4%	8	0.4%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	31	0.5%	9	0.4%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	4	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	101	1.5%	142	7.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	13	0.2%	9	0.4%
95.120	CILIARY BODY CYST	0	0.0%	1	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	2	0.0%	2	0.1%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	5	0.1%	2	0.1%
97.120	COLOBOMA	14	0.2%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	9	0.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	4	0.2%
130.110	MICROPAPILLA	0	0.0%	1	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	43	0.6%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	271	4.1%	42	2.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	43	0.6%	16	0.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	17	0.3%	6	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	14	0.2%	2	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	9	0.1%	3	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	13	0.2%	8	0.4%
100.306	PUNCTATE CATARACT, NUCLEUS	17	0.3%	4	0.2%
100.307	PUNCTATE CATARACT, CAPSULAR	23	0.3%	12	0.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	51	0.8%	10	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	23	0.3%	1	0.0%

OCULAR DISORDERS REPORT
DACHSHUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 6,683 #	%	2018-2022 2,037 #	%
LENS Continued				
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	18	0.3%	3	0.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	18	0.3%	1	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	10	0.1%	3	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	9	0.1%	5	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	3	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	0	0.0%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	4	0.1%	10	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT	40	0.6%	1	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	3	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***358***	***5.4%***	***78***	***3.8%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	39	0.6%	14	0.7%
110.135 PHPV/ PTVL	15	0.2%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.0%	3	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	38	0.6%	5	0.2%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	58	0.9%	15	0.7%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	7	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	125	1.9%	2	0.1%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	5	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	1	0.0%
120.960 RETINOPATHY	2	0.0%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	21	0.3%	3	0.1%
130.120 OPTIC NERVE HYPOPLASIA	40	0.6%	0	0.0%
130.150 OPTIC DISC COLOBOMA	26	0.4%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	89	1.3%	0	0.0%
900.100 OTHER, NOT INHERITED	200	3.0%	4	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	120	1.8%	95	4.7%
NORMAL				
.000 NORMAL GLOBE	5,182	77.5%	1,470	72.2%

DALMATIAN

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris hypoplasia/sphincter dysplasia**.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	3	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
D.	Iris hypoplasia/iris sphincter dysplasia	Not defined	1	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
F.	Cataract	Not defined	1, 2	NO
G.	Vitreous degeneration			
	- syneresis	Not defined	1	Breeder option

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Iris Hypoplasia

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the OFA form.

**Historical note: Previously described iris sphincter dysplasia: a congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue at the level of the iris sphincter, causing pupillary dilation. This abnormality has been noted in the Dalmatian breed.

E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

**Note: Iris sphincter dysplasia is a congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue at the level of the iris sphincter, causing pupillary dilation. This abnormality was historically listed on this breed's page, however, it is no longer reported consistently in this breed, so it was removed from the breed page. As this condition may result in discomfort, examiners should still be aware that this has historically affected this breed and perform a pre-dilation exam to screen for this condition.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract*. 1963;4:447-456.

3. Slater MR, Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc*. 1986;188:1028-1030. PMID: 3710885

OCULAR DISORDERS REPORT
DALMATIAN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,151 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,273 #	 %
GLOBE				
.110 MICROPHTHALMIA	1	0.0%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	5	0.2%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110 DISTICHIASIS	150	4.8%	53	4.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	4	0.3%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.1%	0	0.0%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	83	2.6%	33	2.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	53	1.7%	20	1.6%
93.120 IRIS CYST	3	0.1%	0	0.0%
93.150 IRIS COLOBOMA	16	0.5%	0	0.0%
93.180 IIRIS SPHINCTER DYSPLASIA	18	0.6%	3	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	26	0.8%	15	1.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.1%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.2%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.1%	2	0.2%
95.120 CILIARY BODY CYST	0	0.0%	1	0.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	3	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.2%
120.960 RETINOPATHY	0	0.0%	2	0.2%
LENS				
100.200 CATARACT, UNSPECIFIED	1	0.0%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	62	2.0%	27	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	21	0.7%	9	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	8	0.3%	3	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	11	0.3%	3	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.1%	1	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS	6	0.2%	4	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR	3	0.1%	2	0.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	26	0.8%	8	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	14	0.4%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	14	0.4%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.1%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	6	0.2%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	3	0.1%	4	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	4	0.1%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.1%	1	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.1%

OCULAR DISORDERS REPORT
DALMATIAN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,151 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,273 #	 %
LENS Continued				
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	1	0.0%	1	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT	6	0.2%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***136***	***4.3%***	***39***	***3.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.0%	5	0.4%
110.135 PHPV/ PTVL	2	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	9	0.3%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	22	0.7%	6	0.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	14	0.4%	5	0.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	4	0.3%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	7	0.2%	1	0.1%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	2	0.1%	3	0.2%
OPTIC NERVE				
130.110 MICROPAPILLA	2	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	43	1.4%	0	0.0%
900.100 OTHER, NOT INHERITED	90	2.9%	2	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	130	4.1%	40	3.1%
NORMAL				
.000 NORMAL GLOBE	2,594	82.3%	1,064	83.6%

DANDIE DINMONT TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2, 3	NO
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option

Description and Comments

A. Glaucoma

Glaucoma is an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

In the Dandie Dinmont terrier a 9.5 Mb susceptibility locus has been identified on canine chromosome 8. The definitive mutation has not been determined. A genetic test is not yet available.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

References

1. ACVO Genetics Committee and/or Data from /OFA All-Breeds Report.

2. Ahonen SJ, Pietila E, Mellersh CS, et al. Genome-wide association study identifies a novel canine glaucoma locus. *PloS one*. 2013;8:e70903. PMID: 23951034

3. Oliver JA, Ekiri A, Mellersch CS. Prevalence of pectinate ligament dysplasia and associations with age, sex and intraocular pressure in the Basset hound, Flat-coated retriever, and Dandie Dinmont Terrier. *Canine Genetics and Epidemiology*(2016) 3:1 PMID: 26973793. DOI 10.1186/s40575-016-0033-1.

OCULAR DISORDERS REPORT
DANDIE DINMONT TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	278		92	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.4%	0	0.0%
10.000	GLAUCOMA	1	0.4%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	21	7.6%	2	2.2%
CORNEA					
70.700	CORNEAL DYSTROPHY	6	2.2%	2	2.2%
UVEA					
93.120	IRIS CYST	1	0.4%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.4%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	28	10.1%	6	6.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.4%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	1.8%	2	2.2%
LENS					
100.200	CATARACT, UNSPECIFIED	4	1.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	30	10.8%	5	5.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	5	1.8%	1	1.1%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	3	1.1%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.4%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.7%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	5	1.8%	4	4.3%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	5	1.8%	1	1.1%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.4%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.4%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	5	1.8%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.4%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***32***	***11.5%***	***6***	***6.5%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	3	1.1%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	6	2.2%	0	0.0%
900.100	OTHER, NOT INHERITED	7	2.5%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	7	2.5%	1	1.1%
NORMAL					
.000	NORMAL GLOBE	189	68.0%	74	80.4%

DANISH BROHOLMER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the DANISH BROHOLMER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
DANISH BROHOLMER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2 #	%	2018-2022 0 #	%
NORMAL				
.000 NORMAL GLOBE	2	100.0%	0	

DANISH SWEDISH FARMDOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the DANISH SWEDISH FARMDOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
DANISH SWEDISH FARMDOG

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 29 #	%	Year Examined: 2018-2022 Total # Dogs: 66 #	%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3	10.3%	3	4.5%
LENS					
100.316	INCIPIENT CATARACT, NUCLEUS	1	3.4%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	1.5%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***1***	***3.4%***	***0***	***0.0%***
FUNDUS					
130.110	MICROPAPILLA	0	0.0%	1	1.5%
OTHER					
900.100	OTHER, NOT INHERITED	1	3.4%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	3.4%	1	1.5%
NORMAL					
.000	NORMAL GLOBE	24	82.8%	60	90.9%

DOBERMAN PINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	2-5	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1-5	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Persistent hyperplastic primary vitreous/ Persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Presumed dominant/ incomplete penetrance	6-14	NO
F.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
G.	Ligneous conjunctivitis	Not defined	15	NO

Description and Comments

A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (retinal dysplasia). Note that this syndrome is distinct from "E," PHPV/PHTVL, which may also be associated with microphthalmia.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies.

Cataracts have been infrequently observed in the Doberman Pinscher and there is no specific location attributed to cataracts within the Doberman lens. Most cataracts are bilateral, usually observed within the first two years of life, and may cause significant vision loss.

E. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The condition in the Doberman includes a spectrum of malformations ranging from spots of pigment on the posterior surface of the lens to posterior lenticonus, cataract and a dense fibrous plaque on the posterior surface of the lens. In the more severe forms, partial or complete vision impairment occurs. PHPV has been extensively studied in the Doberman in Europe. This disorder has been observed occasionally in the Doberman in the United States.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

G. Ligneous conjunctivitis

A rare type of conjunctivitis characterized by the formation of thick membranes covering conjunctiva of the nictitans and eyelids of affected dogs. This condition has been diagnosed in four unrelated Doberman Pinschers, three of which had life-threatening systemic disease.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Arnvjerg J and Jensen OA. Spontaneous microphthalmia in two Doberman puppies with anterior chamber cleavage syndrome. *J Am Anim Hosp Assoc*. 1982;18:481.

3. Bergsjo T, Arnesen K, Heim P, et al. Congenital blindness with ocular developmental anomalies, including retinal dysplasia, in Doberman Pinscher dogs. *J Am Vet Med Assoc.* 1984 Jun

1;184:1383-1386. PMID: 6429110

4. Peiffer RL, Jr. and Fischer CA. Microphthalmia, retinal dysplasia, and anterior segment dysgenesis in a litter of Doberman Pinschers. *J Am Vet Med Assoc.* 1983 Oct 15;183:875-878. PMID: 6415022

5. Lewis DG, Kelly DF and Sansom J. Congenital microphthalmia and other developmental ocular anomalies in the Doberman. *J Small Anim Pract.* 1986;27:559.

6. van der Linde-Sipman JS, Stades FC and de Wolff-Rouen-daal D. Persistent hyperplastic tunica vasculosa lentis and persistent hyperplastic primary vitreous in the Doberman Pinscher: Pathologic aspects. *J Am Anim Hosp Assoc.* 1983;19:791.

7. Stades FC. Persistent hyperplastic tunica vasculosa lentis and persistent hyperplastic primary vitreous (PHTVL/PHPV) in ninety closely related Pinschers. *J Am Anim Hosp Assoc.* 1980;16:739.

8. Stades FC. Persistent hyperplastic tunica vasculosa lentis and persistent hyperplastic primary vitreous in Doberman Pinschers: Techniques and results of surgery. *J Am Anim Hosp Assoc.* 1983;19:393.

9. Stades FC. Persistent hyperplastic tunica vasculosa lentis and persistent hyperplastic primary vitreous in Doberman Pinschers: Genetic aspects. *J Am Anim Hosp Assoc.* 1983;19:957.

10. Boeve MH, van der Linde-Sipman JS, Stades FC, et al. Early morphogenesis of persistent hyperplastic tunica vasculosa lentis and primary vitreous. A transmission electron microscopic study. *Invest Ophthalmol Vis Sci.* 1990 Sep;31:1886-1894. PMID: 2211034

11. Boeve MH, van der Linde-Sipman JS and Stades FC. Early morphogenesis of persistent hyperplastic tunica vasculosa lentis and primary vitreous. The dog as an ontogenetic model. *Invest Ophthalmol Vis Sci.* 1988 Jul;29:1076-1086. PMID: 3417401

12. Stades FC, Boeve MH, van den Brom WE, et al. The incidence of PHTVL/PHPV in Dobermans and the results of breeding rules. *Vet Quarterly.* 1991;13:24. PMID: 2021051

13. Anderson DE. The incidence of PHTVL/PHPV in Dobermans and the results of breeding. *J Hered.* 1991;82:21.

14. Boeve MH and Stades FC. Persistent hyperplastic tunica vasculosa lentis and primary vitreous (PHTVL/PHPV) in the dog: A comparative review. prog *Vet Comp Ophthalmol.* 1992;2:163.

15. Ramsey DT, Ketring K, Glaze MB, et al. Ligneous conjunctivitis in four Doberman Pinschers. *J Am Anim Hosp Assoc.* 1996;32:439-447. PMID: 8875361

OCULAR DISORDERS REPORT
DOBERMAN PINSCHER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	5,780		1,304	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	7	0.1%	0	0.0%
10.000	GLAUCOMA	0	0.0%	1	0.1%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	7	0.1%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110	DISTICHIASIS	96	1.7%	20	1.5%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.0%	1	0.1%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	8	0.1%	2	0.2%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	7	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	10	0.2%	3	0.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	4	0.1%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	1	0.0%	1	0.1%
93.120	IRIS CYST	12	0.2%	3	0.2%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	2	0.0%	0	0.0%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	127	2.2%	23	1.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	34	0.6%	2	0.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	10	0.2%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	4	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	133	2.3%	194	14.9%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.1%	3	0.2%
93.810	UVEAL MELANOMA	4	0.1%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	0	0.0%	1	0.1%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	2	0.0%	0	0.0%
97.120	COLOBOMA	1	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
130.110	MICROPAPILLA	0	0.0%	1	0.1%
LENS					
100.200	CATARACT, UNSPECIFIED	32	0.6%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	323	5.6%	52	4.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	23	0.4%	8	0.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	6	0.1%	6	0.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	5	0.1%	1	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	4	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	22	0.4%	5	0.4%
100.306	PUNCTATE CATARACT, NUCLEUS	21	0.4%	10	0.8%
100.307	PUNCTATE CATARACT, CAPSULAR	46	0.8%	24	1.8%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	13	0.2%	4	0.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	18	0.3%	5	0.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	8	0.1%	3	0.2%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	10	0.2%	2	0.2%

OCULAR DISORDERS REPORT
DOBERMAN PINSCHER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 5,780 #	 %	2018-2022 1,304 #	 %
LENS Continued				
100.316 INCIPIENT CATARACT, NUCLEUS	21	0.4%	12	0.9%
100.317 INCIPIENT CATARACT, CAPSULAR	12	0.2%	7	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	2	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	0	0.0%	3	0.2%
100.328 Y-SUTURE TIP OPACITIES	6	0.1%	8	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT	15	0.3%	1	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.0%	3	0.2%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***258***	***4.5%***	***95***	***7.3%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	19	0.3%	12	0.9%
110.135 PHPV/ PTVL	45	0.8%	13	1.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	1	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	10	0.2%	2	0.2%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	98	1.7%	4	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	12	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	12	0.2%	3	0.2%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	2	0.2%
120.960 RETINOPATHY	1	0.0%	0	0.0%
120.970 CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.1%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	3	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	57	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	169	2.9%	3	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	123	2.1%	86	6.6%
NORMAL				
.000 NORMAL GLOBE	4,796	83.0%	894	68.6%

DOGO ARGENTINO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the DOGO ARGENTINO breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
DOGO ARGENTINO

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	134		64	
	Diagnostic Name	**#**	**%**	**#**	**%**
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	0	0.0%	1	1.6%
25.110	DISTICHIASIS	1	0.7%	2	3.1%
CORNEA					
70.700	CORNEAL DYSTROPHY	1	0.7%	3	4.7%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.7%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	14	10.4%	1	1.6%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.7%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	1	0.7%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.7%	1	1.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.7%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	2	3.1%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	3	2.2%	1	1.6%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	1.6%
100.316	INCIPIENT CATARACT, NUCLEUS	2	1.5%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.7%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***8***	***6.0%***	***4***	***6.3%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.7%	0	0.0%
OTHER					
900.100	OTHER, NOT INHERITED	1	0.7%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.7%	6	9.4%
NORMAL					
.000	NORMAL GLOBE	113	84.3%	50	78.1%

DOGUE DE BORDEAUX

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Ectropion	Not defined	1	Breeder option	
C.	Distichiasis	Not defined	1	Breeder option	
D.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Multifocal retinopathy - *cmr1*	Autosomal recessive	2	NO (Breeder option with Normal DNA test for CMR)	Mutation in the *BEST1* gene

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Entropion in the Mastiff is severe and may require multiple surgical corrections.

B. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous sub-retinal fluid, or accumulation of sub-retinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Zangerl B, Wickström K, Slavik J, Lindauer SJ, Ahonen S, Schelling C, Lohi H, Guziewicz KE, Aguirre GD. Assessment of canine BEST1 variations identifies new mutations and establishes an independent bestrophinopathy model (cmr3). Mol Vis. 2010 Dec 16;16:2791-804. PMID: 21197113; PMCID: PMC3008713.

OCULAR DISORDERS REPORT
DOGUE DE BORDEAUX

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 335 #	 %	Year Examined: 2018-2022 Total # Dogs: 97 #	 %
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	9	2.7%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	22	6.6%	19	19.6%
22.000 ECTROPION, UNSPECIFIED	38	11.3%	12	12.4%
25.110 DISTICHIASIS	32	9.6%	9	9.3%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.3%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	7	2.1%	5	5.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.3%	0	0.0%
UVEA				
93.120 IRIS CYST	2	0.6%	2	2.1%
93.170 ANTERIOR CHAMBER CYST	1	0.3%	1	1.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	16	4.8%	1	1.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.3%	1	1.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	4	1.2%	1	1.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	1.5%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.3%	1	1.0%
95.120 CILIARY BODY CYST	2	0.6%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	9	2.7%	2	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.3%	1	1.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	1.0%
100.306 PUNCTATE CATARACT, NUCLEUS	4	1.2%	2	2.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	2	2.1%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.3%	1	1.0%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***8***	***2.4%***	***8***	***8.2%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.3%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	6	1.8%	1	1.0%
120.960 RETINOPATHY	1	0.3%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	6	1.8%	0	0.0%
900.100 OTHER, NOT INHERITED	10	3.0%	2	2.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	2.4%	2	2.1%
NORMAL				
.000 NORMAL GLOBE	225	67.2%	52	53.6%

DRENTSCH PARTRIJSHOND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the DRENTSCH PARTRIJSHOND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
DRENTSCHE PATRIJSHOND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	17		35	
	Diagnostic Name	#	%	#	%
UVEA					
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	5.9%	2	5.7%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	5.9%	2	5.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	5.9%	1	2.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	5.9%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	1	5.9%	1	2.9%
100.307	PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	2.9%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***3***	***17.6%***	***3***	***8.6%***
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	2.9%
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	11.8%	2	5.7%
NORMAL					
.000	NORMAL GLOBE	13	76.5%	29	82.9%

DREVER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the DREVER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
DREVER

There are no statistics available for this breed

DUTCH SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
DUTCH SHEPHERD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 81 #	 %	Year Examined: 2018-2022 Total # Dogs: 120 #	 %
EYELIDS				
25.110 DISTICHIASIS	3	3.7%	0	0.0%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	0	0.0%	1	0.8%
CORNEA				
70.210 PANNUS	0	0.0%	1	0.8%
70.700 CORNEAL DYSTROPHY	1	1.2%	3	2.5%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	6	5.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	2.5%	2	1.7%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	11	13.6%	9	7.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	2	2.5%	1	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	4	3.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	2.5%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	1.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	2	1.7%
100.306 PUNCTATE CATARACT, NUCLEUS	5	6.2%	2	1.7%
100.307 PUNCTATE CATARACT, CAPSULAR	3	3.7%	3	2.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	2	2.5%	1	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	1.2%	2	1.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	1.2%	1	0.8%
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	2	1.7%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***17***	***21.0%***	***16***	***13.3%***
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	1.7%
120.960 RETINOPATHY	0	0.0%	1	0.8%
RETINA				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	1.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	3	3.7%	0	0.0%
900.100 OTHER, NOT INHERITED	0	0.0%	1	0.8%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	4.9%	8	6.7%
NORMAL				
.000 NORMAL GLOBE	65	80.2%	86	71.7%

ECT LANDSEER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ECT LANDSEER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
ECT LANDSEER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1 #	 %	Year Examined: 2018-2022 Total # Dogs: 1 #	 %
NORMAL				
.000 NORMAL GLOBE	1	100.0%	1	100.0%

ENGLISH COCKER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Keratoconjunctivitis sicca	Not defined	2	NO	
B.	Glaucoma	Not defined	3, 4	NO	
C.	Distichiasis	Not defined	1, 5, 15	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1, 6	Breeder option	
	- iris to cornea	Not defined	1, 6	NO	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
E.	Cataract	Not defined	1, 6-9	NO	
F.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- *prcd*	Autosomal recessive	10-14	NO	Mutation in *prcd* gene
G.	Retinal dysplasia				
	- folds	Presumed autosomal recessive	1	Breeder option	

Description and Comments

A. Keratoconjunctivitis sicca (KCS)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

B. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

Glaucoma in the English Cocker Spaniel is recognized in England. The frequency and significance of this disease in the breed in the United States is not known, but is probably low.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the English Cocker Spaniel, this is a particularly serious problem as the majority of PPMs identified on routine screening examination bridge from the iris to the cornea and are associated with corneal opacities which may result in vision impairment. Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Congenital cataracts have been reported in Red Cocker Spaniels, presumably English Cocker Spaniels, in Denmark. The cataracts affected the anterior capsule; in some cases the cortex and/or nucleus were opaque. Associated findings in some dogs were persistent pupillary membrane (PPM) and/or microphthalmia. It is likely that these cataracts are part of a syndrome characterized by multiple congenital ocular anomalies. The condition is familial, but a specific mode of inheritance has not been defined.

F. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- *prcd*

Studies have shown that the principal form of PRA in the English Cocker Spaniel is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. However, in the English Cocker Spaniel, the phenotype can be very variable in the age of onset. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

Other forms of retinal degeneration that are not *prcd* are recognized in the breed. The currently available genetic test will not detect these other forms of PRA.

Historical Note:

Central progressive retinal atrophy/retinal pigment epithelial dystrophy (CPRA/RPED) was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere. In the English Cocker Spaniel, retinal lesions of CPRA have been related to an underlying abnormal metabolism of Vitamin E resulting in a systemic deficiency

G. Retinal dysplasia – folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Sanchez RF, Innocent G, Mould J, et al. Canine keratoconjunctivitis sicca: disease trends in a review of 229 cases. *J Small Anim Pract*. 2007;48:211-217. PMID: 17381766

3. Bedford PG. The aetiology of primary glaucoma in the dog. *J Small Anim Pract*. 1975;16:217-239. PMID: 1142747

4. Bedford PGC. A gonioscopic study of the iridocorneal angle in the English and American Breeds of Cocker Spaniel and the Bassest Hound. *J Small Anim Pract*. 1977;18:631-642. PMID: 604666

5. Petersen T, Proschowsky HT, Hardon T, et al. Prevalence and heritability of distichiasis in the English Cocker spaniel. Canine Genetics and Epidemiology (2015) 2:11 DOI 10.1186/s40575-015-0024-7. PMID: 26401339

6. Strande A, Nicolaissen B, Bjerkas I. Persistent pupillary membrane and congenital cataract in a litter of English Cocker Spaniels. *J Small Anim Pract*. 1988;29:257-260.

7. Olesen HP, Jensen OA, Norn MS. Congenital hereditary cataract in Cocker Spaniels. *J Small Anim Pract*. 1974;15:741-750. PMID: 4449208

8. Engelhardt A, Stock KF, Hamann H, et al. A retrospective study on the prevalence of primary cataracts in two pedigrees from the German population of English Cocker Spaniels. *Vet Ophthalmol*. 2008;11:215-221. PMID: 18638346

9. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract*. 1985;26:305-316.

10. Aguirre GD, Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. *Exp Eye Res*. 1988;46:663-687. 12. PMID: 3164273

11. Downs LM, Hitti R, Pregnolato S, Mellersh CS. Genetic screening for PRA-associated

mutations in multiple dog breeds shows that PRA is heterogeneous within and between breeds. Vet Ophthalmol. 2014 Mar;17(2):126-30. doi: 10.1111/vop.12122. Epub 2013 Nov 21. PMID: 24255994.

12. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

13. Andrade, L. R., et al. (2019). "Allele Frequency of the C.5G>A Mutation in the PRCD Gene Responsible for Progressive Retinal Atrophy in English Cocker Spaniel Dogs." Animals (Basel) 9(10). PMID: 31640229

14. Andrade LR, Caceres AM, Trecenti AS, Brandão CVS, Gandolfi MG, Aguiar EV, Andrade DGA, Borges AS, Oliveira-Filho JP. Allele Frequency of the C.5G>A Mutation in the *PRCD* Gene Responsible for Progressive Retinal Atrophy in English Cocker Spaniel Dogs. Animals (Basel). 2019 Oct 21;9(10):844. doi: 10.3390/ani9100844. PMID: 31640229; PMCID: PMC6826964.

15. ECVO 2021 abstract: Jondeau C, Gounon M, Bourguet A, Chahory S. "Epidemiology and Clinical Significance of Canine Distichiasis: A Retrospective Study of 291 Cases". PMID: 35285574.

OCULAR DISORDERS REPORT
ENGLISH COCKER SPANIEL

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	11,380		1,269	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	14	0.1%	1	0.1%
10.000	GLAUCOMA	1	0.0%	0	0.0%
EYELIDS					
20.110	EYELID DERMOID	1	0.0%	0	0.0%
20.140	ECTOPIC CILIA	6	0.1%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	3	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	49	0.4%	6	0.5%
22.000	ECTROPION, UNSPECIFIED	97	0.9%	1	0.1%
25.110	DISTICHIASIS	2,025	17.8%	205	16.2%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	7	0.6%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	22	0.2%	4	0.3%
40.910	KERATOCONJUNCTIVITIS SICCA	12	0.1%	0	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	6	0.1%	0	0.0%
CORNEA					
70.210	PANNUS	10	0.1%	1	0.1%
70.220	PIGMENTARY KERATITIS	11	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	100	0.9%	11	0.9%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	37	0.3%	0	0.0%
UVEA					
90.250	PIGMENTARY UVEITIS	1	0.0%	0	0.0%
93.120	IRIS CYST	5	0.0%	0	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	6	0.1%	0	0.0%
93.150	IRIS COLOBOMA	2	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	145	1.3%	27	2.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	43	0.4%	4	0.3%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	186	1.6%	8	0.6%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	10	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	53	0.5%	46	3.6%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	18	0.2%	11	0.9%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	0	0.0%	1	0.1%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	7	0.6%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	3	0.2%
130.150	OPTIC DISC COLOBOMA	0	0.0%	3	0.2%
LENS					
100.200	CATARACT, UNSPECIFIED	172	1.5%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	697	6.1%	65	5.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	121	1.1%	36	2.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	57	0.5%	7	0.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	24	0.2%	7	0.6%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	15	0.1%	4	0.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	38	0.3%	6	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	28	0.2%	9	0.7%
100.307	PUNCTATE CATARACT, CAPSULAR	18	0.2%	18	1.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	134	1.2%	6	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	136	1.2%	1	0.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	86	0.8%	7	0.6%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	8	0.1%	0	0.0%

OCULAR DISORDERS REPORT
ENGLISH COCKER SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 11,380 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,269 #	 %
LENS Continued				
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	27	0.2%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	64	0.6%	2	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	20	0.2%	1	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	5	0.0%	2	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.0%	3	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	5	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	3	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	4	0.0%	8	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT	101	0.9%	2	0.2%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	2	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,067***	***9.4%***	***116***	***9.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	9	0.1%	4	0.3%
110.135 PHPV/ PTVL	4	0.0%	1	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	23	0.2%	4	0.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	168	1.5%	14	1.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	15	0.1%	1	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	424	3.7%	0	0.0%
120.400 RETINAL HEMORRHAGE	3	0.0%	0	0.0%
120.960 RETINOPATHY	3	0.0%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	2	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	2	0.0%	1	0.1%
130.150 OPTIC DISC COLOBOMA	15	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	47	0.4%	0	0.0%
900.100 OTHER, NOT INHERITED	242	2.1%	4	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	189	1.7%	60	4.7%
NORMAL				
.000 NORMAL GLOBE	7,706	67.7%	856	67.5%

ENGLISH COONHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ENGLISH COONHOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
ENGLISH COONHOUND

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	1		0	
Diagnostic Name	**#**	**%**	**#**	**%**
NORMAL				
.000 NORMAL GLOBE	1	100.0%	0	

ENGLISH FOXHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ENGLISH FOXHOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
ENGLISH FOXHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3 #	 %	2018-2022 0 #	 %
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	33.3%	0	
NORMAL				
.000 NORMAL GLOBE	2	66.7%	0	

ENGLISH JACK RUSSELL TERRIER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ENGLISH JACK RUSSELL TERRIER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
ENGLISH JACK RUSSELL TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2		1	
Diagnostic Name		#	%	#	%
NORMAL					
.000	NORMAL GLOBE	2	100.0%	1	100.0%

ENGLISH SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Retinal atrophy				
	- rod-cone dysplasia recessive type 1 (*rcd4*)	Autosomal recessive	2, 3	NO	Mutation in the *C2orf71* gene
E.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
F.	Ceroid lipofuscinosis	Autosomal recessive	4-9	NO	Mutation in the *CLN8* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of the dog. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Retinal atrophy - Rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

F. Ceroid lipofuscinosis

An inherited disease of humans and animals characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's Disease.) A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Bjerkas E. Generalised progressive retinal atrophy in the English Setter in Norway. *Vet Rec*. 1990;126:217. PMID: 2316162

3. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. *Anim Genet*. 2012. PMD: 22686255

4. Katz ML, Khan S, Awano T, Shahid SA, Siakotos AN, Johnson GS. A mutation in the CLN8 gene in English Setter dogs with neuronal ceroid-lipofuscinosis. Biochem Biophys Res Commun. 2005 Feb 11;327(2):541-7. doi: 10.1016/j.bbrc.2004.12.038. PMID: 15629147.

5. Koppang N. Neuronal Ceroid-Lipofuscinosis in English Setters Juvenile Amaurosis Familiar Idiocy (AFI) in English Setters. *J Small Anim Pract*. 1969;10:639-644.

6. Armstrong D, Koppang N, Nilsson SE. Canine hereditary ceroid lipofuscinosis. *Eur Neurol*. 1982;21:147-156. PMID: 7117302

7. Koppang N. The English Setter with ceroid-lipofuscinosis: a suitable model for the juvenile type of ceroid-lipofuscinosis in humans. *Am J Med Genet Suppl*. 1988;5:117-125. PMID: 3146311

8. Jolly RD, Palmer DN, Studdert VP. Canine ceroid-lipofuscinoses: A review and classification. *J Small Anim Pract*. 1994;35:299-306.

9. Nilsson SE, Wrigstad A. Electrophysiology in some animal and human hereditary diseases involving the retinal pigment epithelium. Eye (Lond). 1997;11 (Pt 5):698-706. doi: 10.1038/eye.1997.180. PMID: 9474321.

OCULAR DISORDERS REPORT
ENGLISH SETTER

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 1,759 #	 %	Year Examined: 2018-2022 Total # Dogs: 88 #	 %
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	8	0.5%	3	3.4%
22.000	ECTROPION, UNSPECIFIED	3	0.2%	0	0.0%
25.110	DISTICHIASIS	71	4.0%	1	1.1%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	14	0.8%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	3	0.2%	0	0.0%
UVEA					
93.120	IRIS CYST	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	64	3.6%	4	4.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	5	0.3%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	7	0.4%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	3	3.4%
93.810	UVEAL MELANOMA	1	0.1%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	5	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	64	3.6%	7	8.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	6	0.3%	2	2.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	11	0.6%	2	2.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	1	1.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	5	0.3%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	2	0.1%	1	1.1%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	5	0.3%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	8	0.5%	1	1.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.1%	2	2.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.1%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	1	1.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	1.1%
100.328	Y-SUTURE TIP OPACITIES	4	0.2%	1	1.1%
100.330	GENERALIZED/ COMPLETE CATARACT	4	0.2%	1	1.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***59***	***3.4%***	***12***	***13.6%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	7	0.4%	0	0.0%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	4	0.2%	1	1.1%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	35	2.0%	3	3.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	15	0.9%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	22	1.3%	0	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	1	0.1%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
ENGLISH SETTER

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 1,759 #	 %	Year Examined: 2018-2022 Total # Dogs: 88 #	 %
OTHER					
900.000	OTHER, UNSPECIFIED	6	0.3%	0	0.0%
900.100	OTHER, NOT INHERITED	53	3.0%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	0.3%	3	3.4%
NORMAL					
.000	NORMAL GLOBE	1,482	84.3%	61	69.3%

ENGLISH SHEPHERD

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris hypoplasia/iris coloboma.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC TESTS AVAILABLE
A.	Retinal atrophy (*prcd*)	Autosomal recessive	2	NO	Mutation in the *prcd* gene
B.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/coloboma	Autosomal recessive	1, 3-4	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the English Shepherd is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

B. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report

2. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

3. Barnett KC, Stades FC. Collie eye anomaly in the Shetland Sheepdog in the Netherlands. *J Small Anim Pract*. 1979;20:321-329. PMID: 120471

4. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Gen Res*. 2007;17:1562-1571. PMID: 17916641

OCULAR DISORDERS REPORT
ENGLISH SHEPHERD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 138 #	 %	Year Examined: 2018-2022 Total # Dogs: 26 #	 %
GLOBE				
.110 MICROPHTHALMIA	2	1.4%	0	0.0%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	5	3.6%	0	0.0%
25.110 DISTICHIASIS	1	0.7%	2	7.7%
CORNEA				
70.210 PANNUS	1	0.7%	0	0.0%
70.700 CORNEAL DYSTROPHY	1	0.7%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	6	4.3%	1	3.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.7%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	2.2%	3	11.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	2	1.4%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.7%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.7%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.7%	2	7.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	3.8%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.7%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	1.4%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	3	2.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	4	2.9%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***16***	***11.6%***	***3***	***11.5%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	1.4%	0	0.0%
OTHER				
900.100 OTHER, NOT INHERITED	4	2.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	9	6.5%	3	11.5%
NORMAL				
.000 NORMAL GLOBE	107	77.5%	19	73.1%

ENGLISH SPRINGER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
E.	Cataract	Not defined	1	NO	
F.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- *cord-1*	Autosomal recessive	1, 3	NO	Mutation in the *RPGRIP1* gene
H.	Retinal dysplasia				
	- folds	Presumed autosomal recessive	1, 4-6, 9	NO	
	- geographic	Not defined	4-6	NO	
I.	Refractive error	Not defined	7, 8	Breeder option	

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the English Springer Spaniel this usually involves the lower lateral lid margin.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted

E. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies.

Cataract in the English Springer Spaniel is reported to be a familial trait usually involving the posterior subcapsular region of the lens that progresses slowly.

F. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

G. Retinal atrophy - *cord-1*

Cord-1 PRA in the English Springer Spaniel has an onset of clinical signs at 2 to 9 years of age leading to blindness in most affected dogs. *Cord1* PRA in the English Springer Spaniel has been described as beginning with increased granularity of the fundus or tiny hyporeflective brown or grey patches in the far peripheral tapetum. Over time, these abnormalities become more diffuse with mottling over much of the tapetum. Vessel attenuation accompanies the more diffuse changes. In advanced cases, there is generalized tapetal hyperreflectivity and vessel attenuation. Pedigree analysis has shown cord-1 in the English Springer Spaniel to be an autosomal recessive trait. A mutation in the *RPGRIP1* gene in cone-rod dystrophy (*cord1*) was found through genetic testing to be associated with one form of PRA in English Springer Spaniels, but not all clinically affected dogs have the *RPGRIP1* mutation, implying that other mutations have yet to be identified. A DNA test is available. The test is accurate only for this mutation and will not identify other forms of PRA. Not all dogs homozygous for the *RPGRIP1* genotype demonstrate the phenotype clinically.

H. Retinal dysplasia –

folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

The relationship between folds and geographic/detached lesions has been a topic of dispute for many years. It is the consensus of the English Springer Spaniel Field Trial Association Heritable Defects Committee (the parent breed club in the United States) that none of the forms of retinal dysplasia are desirable in a breeding animal.

Clinically the retinal dysplasia observed in this breed is unique and distinct from the classical “folds” or “geographic” forms of dysplasia.

- geographic

An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

Clinically the retinal dysplasia observed in this breed is unique and distinct from the classical “folds” or “geographic” forms of dysplasia.

J. Refractive Myopia

A condition of the eye where the light that comes in does not directly focus on the retina but in front of it. In common terminology, "near-sighted." This condition has been shown to have a genetic component in English Springer Spaniels, although the exact mode of inheritance has not been determined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Lheriteau E, Petit L, Weber M, et al. Successful gene therapy in the RPGRIP1-deficient dog: a large model of cone-rod dystrophy. *Mol Ther*. 2014;22:265-277. PMID: 24091916

3. Narfstrom K, Jeong M, Hyman J, et al. Assessment of hereditary retinal degeneration in the English Springer Spaniel dog and disease relationship to an RPGRIP1 mutation. *Stem Cells Int*. 2012;2012:685901. PMID: 22550515

4. Schmidt GM, Ellersieck MR, Wheeler CA, et al. Inheritance of retinal dysplasia in the English Springer Spaniel. *Journal of the American Veterinary Medical Association*. 1979;174:1089-1090. PMID: 438039

5. Lavach JDea. Retinal dysplasia in the English Springer Spaniel. *J Am Anim Hosp Assoc*. 1978;14:192-199.

6. Toole DO. Retinal dysplasia in English Springer Spaniel dogs: Light microscopy of the postnatal lesions. *Veterinary pathology*. 1983;20:298-311. PMID: 6879955

7. Kubai MA, Bentley E, Miller PE, et al. Refractive states of eyes and association between ametropia and breed in dogs. *Am J Vet Res*. 2008;69:946-951. PMID: 18593249

8. Kubai MA, Labelle AL, Hamor RE, et al. Heritability of lenticular myopia in English Springer Spaniels. *Invest Ophthalmol Vis Sci*. 2013;54:7324-7328. PMID: 24071952

9. Historical breed club request.

OCULAR DISORDERS REPORT
ENGLISH SPRINGER SPANIEL

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	49,866		6,621	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	28	0.1%	1	0.0%
10.000	GLAUCOMA	7	0.0%	0	0.0%
EYELIDS					
20.110	EYELID DERMOID	2	0.0%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	3	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	293	0.6%	56	0.8%
22.000	ECTROPION, UNSPECIFIED	59	0.1%	4	0.1%
25.110	DISTICHIASIS	396	0.8%	50	0.8%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.0%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	8	0.0%	3	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	11	0.0%	1	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	8	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	6	0.0%	1	0.0%
70.220	PIGMENTARY KERATITIS	4	0.0%	2	0.0%
70.700	CORNEAL DYSTROPHY	615	1.2%	108	1.6%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	12	0.0%	1	0.0%
UVEA					
90.250	PIGMENTARY UVEITIS	0	0.0%	1	0.0%
93.110	IRIS HYPOPLASIA	12	0.0%	4	0.1%
93.120	IRIS CYST	15	0.0%	3	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	4	0.0%	0	0.0%
93.150	IRIS COLOBOMA	30	0.1%	1	0.0%
93.170	ANTERIOR CHAMBER CYST	3	0.0%	2	0.0%
93.180	IIRIS SPHINCTER DYSPLASIA	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3,817	7.7%	556	8.4%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	125	0.3%	4	0.1%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	90	0.2%	5	0.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	48	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	89	0.2%	63	1.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	16	0.0%	2	0.0%
93.810	UVEAL MELANOMA	2	0.0%	0	0.0%
95.120	CILIARY BODY CYST	1	0.0%	1	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	4	0.0%	0	0.0%
97.120	COLOBOMA	5	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	42	0.6%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	23	0.3%
120.190	RETINAL DYSPLASIA, DETACHED	0	0.0%	2	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	8	0.1%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
120.960	RETINOPATHY	0	0.0%	4	0.1%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	2	0.0%
130.110	MICROPAPILLA	0	0.0%	1	0.0%
130.150	OPTIC DISC COLOBOMA	0	0.0%	1	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	97	0.2%	0	0.0%

OCULAR DISORDERS REPORT
ENGLISH SPRINGER SPANIEL

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 49,866 #	 %	Year Examined: 2018-2022 Total # Dogs: 6,621 #	 %
LENS Continued					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,245	2.5%	203	3.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	254	0.5%	91	1.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	123	0.2%	18	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	60	0.1%	18	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	26	0.1%	7	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	101	0.2%	20	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	68	0.1%	26	0.4%
100.307	PUNCTATE CATARACT, CAPSULAR	77	0.2%	45	0.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	220	0.4%	35	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	215	0.4%	25	0.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	111	0.2%	11	0.2%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	25	0.1%	4	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	42	0.1%	9	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	73	0.1%	12	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	35	0.1%	19	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	10	0.0%	4	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	7	0.0%	8	0.1%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	3	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	6	0.0%	1	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	5	0.0%	2	0.0%
100.328	Y-SUTURE TIP OPACITIES	21	0.0%	15	0.2%
100.330	GENERALIZED/ COMPLETE CATARACT	91	0.2%	2	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	3	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	27	0.1%	3	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***1,649***	***3.3%***	***363***	***5.5%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	255	0.5%	85	1.3%
110.135	PHPV/ PTVL	42	0.1%	1	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	8	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	212	0.4%	24	0.4%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	1,942	3.9%	101	1.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	734	1.5%	29	0.4%
120.190	RETINAL DYSPLASIA, DETACHED	126	0.3%	3	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	491	1.0%	17	0.3%
120.400	RETINAL HEMORRHAGE	8	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	57	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	1	0.0%
120.960	RETINOPATHY	21	0.0%	4	0.1%
OPTIC NERVE					
130.110	MICROPAPILLA	12	0.0%	2	0.0%
130.120	OPTIC NERVE HYPOPLASIA	9	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	13	0.0%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	336	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	729	1.5%	6	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	500	1.0%	176	2.7%
NORMAL					
.000	NORMAL GLOBE	40,881	82.0%	5,197	78.5%

ENGLISH TOY SPANIEL

(King Charles, Prince Charles, Ruby, Blenheim)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Pigmentary keratitis	Not defined	1	Breeder option
D.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
E.	Persistent pupillary membrane			
	- iris to iris	Not defined	1	Breeder option
F.	Cataract	Not defined	1	NO
G.	Persistent hyperplastic primary vitreous /Persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Presumed dominant/ incomplete penetrance	1	NO
H.	Persistent hyaloid artery remnant	Not defined	1	Breeder option
I.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comments

A. Entropion

A conformational defect resulting in "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures, which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Exposure/pigmentary keratitis

A condition characterized by variable degrees of superficial vascularization, fibrosis, and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos, and macropalpebral fissure.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Onset of cataract in the English Toy Spaniel is at an early age (less than 6 months), affecting the cortex and nucleus with rapid progression to complete cataract, resulting in blindness.

G. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

H. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
ENGLISH TOY SPANIEL

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,222		416	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	4	0.3%	3	0.7%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.1%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	10	0.8%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	58	4.7%	7	1.7%
22.000	ECTROPION, UNSPECIFIED	3	0.2%	0	0.0%
25.110	DISTICHIASIS	136	11.1%	32	7.7%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	2	0.2%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	0	0.0%	1	0.2%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.2%	0	0.0%
CORNEA					
70.210	PANNUS	1	0.1%	0	0.0%
70.220	PIGMENTARY KERATITIS	20	1.6%	5	1.2%
70.700	CORNEAL DYSTROPHY	163	13.3%	74	17.8%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	4	0.3%	3	0.7%
UVEA					
93.120	IRIS CYST	1	0.1%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	0	0.0%	1	0.2%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	13	1.1%	15	3.6%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.2%	1	0.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	1	0.2%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	0.4%	4	1.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	0	0.0%	1	0.2%
LENS					
100.200	CATARACT, UNSPECIFIED	10	0.8%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	68	5.6%	12	2.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	24	2.0%	8	1.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	21	1.7%	1	0.2%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	7	0.6%	1	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	6	0.5%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	9	0.7%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	29	2.4%	3	0.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	28	2.3%	10	2.4%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	25	2.0%	6	1.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	5	0.4%	3	0.7%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	14	1.1%	3	0.7%
100.317	INCIPIENT CATARACT, CAPSULAR	16	1.3%	2	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	5	0.4%	3	0.7%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.3%	5	1.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	2	0.2%	1	0.2%
100.326	INCOMPLETE CATARACT, NUCLEUS	4	0.3%	2	0.5%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.2%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	3	0.2%	1	0.2%
100.330	GENERALIZED/ COMPLETE CATARACT	20	1.6%	2	0.5%
100.340	RESORBING/ HYPERMATURE CATARACT	3	0.2%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***235***	***19.2%***	***50***	***12.0%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	101	8.3%	47	11.3%

OCULAR DISORDERS REPORT
ENGLISH TOY SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,222 #	 %	2018-2022 416 #	 %
VITREOUS Continued				
110.135 PHPV/ PTVL	15	1.2%	5	1.2%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	1	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS	21	1.7%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	9	2.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.2%
120.960 RETINOPATHY	0	0.0%	1	0.2%
130.110 MICROPAPILLA	0	0.0%	1	0.2%
130.150 OPTIC DISC COLOBOMA	0	0.0%	1	0.2%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	61	5.0%	14	3.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	8	0.7%	3	0.7%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	6	0.5%	1	0.2%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.1%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	55	4.5%	0	0.0%
900.100 OTHER, NOT INHERITED	38	3.1%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	66	5.4%	14	3.4%
NORMAL				
.000 NORMAL GLOBE	611	50.0%	196	47.1%

ENTLEBUCHER MOUNTAIN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	2	NO	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Presumed autosomal recessive	2, 3	NO	
D.	Vitreal degeneration				
	- syneresis	Not defined	1	Breeder option	
E.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1, 2, 4	NO	Mutation in the *prcd* gene
F.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Glaucoma

Glaucoma is an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Cataracts in the Entlebucher Mountain Dog generally become evident in young to middle-aged dogs (5.5 +/- 2.6 years). The opacities typically begin in the posterior subcapsular/capsular polar region along the suture lines as early as 1-2 years of age. Most dogs are affected with bilaterally symmetrical cataracts, which may or may not progress. Pedigree analysis suggests an autosomal recessive mode of inheritance.

D. Vitreous degeneration - syneresis

Liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

E. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Entlebucher Mountain Dog is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Spiess BM. [Inherited eye diseases in the Entlebucher Mountain Dog]. *Schweizer Archiv fur Tierheilkunde*. 1994;136:105-110. Vererbte Augenkrankheiten beim Entlebucher Sennenhund. PMID: 8171308

3. Heitmann M, Hamann H, Brahm R, et al. Analysis of prevalence of presumed inherited eye diseases in Entlebucher Mountain Dogs. *Vet Ophthalmol*. 2005;8:145-151. PMID: 15910366

4. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

OCULAR DISORDERS REPORT
ENTLEBUCHER MOUNTAIN DOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,115		288	
	Diagnostic Name	**#**	**%**	**#**	**%**
EYELIDS					
20.140	ECTOPIC CILIA	1	0.1%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110	DISTICHIASIS	11	1.0%	2	0.7%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	3	0.3%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	5	0.4%	1	0.3%
UVEA					
93.120	IRIS CYST	2	0.2%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	53	4.8%	8	2.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	4	0.4%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.2%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	10	0.9%	11	3.8%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	70	6.3%	24	8.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	7	0.6%	11	3.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	41	3.7%	10	3.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	8	0.7%	1	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.3%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.4%	1	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.4%	3	1.0%
100.307	PUNCTATE CATARACT, CAPSULAR	17	1.5%	12	4.2%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	14	1.3%	1	0.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	76	6.8%	21	7.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	9	0.8%	5	1.7%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	4	0.4%	1	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	4	0.4%	1	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	11	1.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.4%	2	0.7%
100.330	GENERALIZED/ COMPLETE CATARACT	9	0.8%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***216***	***19.4%***	***69***	***24.0%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	2	0.7%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	3	1.0%
110.320	VITREOUS DEGENERATION SYNERESIS	8	0.7%	7	2.4%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	29	2.6%	2	0.7%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	7	0.6%	1	0.3%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	30	2.7%	0	0.0%
120.960	RETINOPATHY	2	0.2%	0	0.0%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.3%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.3%
120.960	RETINOPATHY	0	0.0%	1	0.3%

OCULAR DISORDERS REPORT
ENTLEBUCHER MOUNTAIN DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,115 #	 %	Year Examined: 2018-2022 Total # Dogs: 288 #	 %
OPTIC NERVE				
130.110 MICROPAPILLA	2	0.2%	1	0.3%
130.120 OPTIC NERVE HYPOPLASIA	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	20	1.8%	0	0.0%
900.100 OTHER, NOT INHERITED	41	3.7%	1	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	35	3.1%	17	5.9%
NORMAL				
.000 NORMAL GLOBE	816	73.2%	196	68.1%

EPAGNEUL BRETON

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the EPAGNEUL BRETON breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
EPAGNEUL BRETON

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	17		21	
	Diagnostic Name	**#**	**%**	**#**	**%**
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	11.8%	1	4.8%
LENS					
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1	5.9%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	5.9%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	4.8%
100.328	Y-SUTURE TIP OPACITIES	1	5.9%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***2***	***11.8%***	***1***	***4.8%***
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	11.8%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	12	70.6%	19	90.5%

ESTRELA MOUNTAIN DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ESTRELA MOUNTAIN DOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
ESTRELA MOUNTAIN DOG

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	3		1	
Diagnostic Name	**#**	**%**	**#**	**%**
NORMAL				
.000 NORMAL GLOBE	3	100.0%	1	100.0%

EURASIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2-4	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Cataracts	Not defined	1	NO

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening examination.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Cataracts

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Boillot T, Rosolen SG, Dulaurent T, Goulle F, Thomas P, Isard PF, Azoulay T, Lafarge-Beurlet S, Woods M, Lavillegrand S, Ivkovic I, Neveux N, Sahel JA, Picaud S, Froger N. Determination of morphological, biometric and biochemical susceptibilities in healthy Eurasier dogs with suspected inherited glaucoma. PLoS One. 2014 Nov 7;9(11):e111873. doi: 10.1371/journal.pone.0111873. PMID: 25380252

3. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol*. 2011;14:121-126. Epub 2011/03/04. PMID: 21366828

4. Rosolen SG, Boillot T, Dulaurent T, et al. Morphological, biometrical and biochemical susceptibilities for glaucoma in a healthy Eurasier dog - ECVO 2014 abstract #44. *Vet Ophthalmol*. 2014;17:E23.

OCULAR DISORDERS REPORT
EURASIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 132 #	 %	Year Examined: 2018-2022 Total # Dogs: 102 #	 %
EYELIDS				
25.110 DISTICHIASIS	42	31.8%	24	23.5%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	1.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	3	2.3%	3	2.9%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3	2.3%	2	2.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.8%	1	1.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	0	0.0%	1	1.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	7	5.3%	4	3.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	2	2.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	1.5%	1	1.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	6	4.5%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	1.0%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.8%	1	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	2	1.5%	2	2.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.8%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	2	1.5%	1	1.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***12***	***9.1%***	***7***	***6.9%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.8%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	1	0.8%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	0	0.0%	1	1.0%
OTHER				
900.000 OTHER, UNSPECIFIED	5	3.8%	0	0.0%
900.100 OTHER, NOT INHERITED	5	3.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	3.0%	2	2.0%
NORMAL				
.000 NORMAL GLOBE	81	61.4%	63	61.8%

FIELD SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
E.	Cataract	Not defined	1	NO	
F.	Retinal atrophy				
	- (*prcd)*	Autosomal recessive	1, 2	NO	Mutation in the *prcd* gene
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Field Spaniel is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
FIELD SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,738 #	%	2018-2022 751 #	%
GLOBE				
.110 MICROPHTHALMIA	1	0.0%	1	0.1%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	6	0.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	10	0.4%	2	0.3%
22.000 ECTROPION, UNSPECIFIED	11	0.4%	1	0.1%
25.110 DISTICHIASIS	170	6.2%	35	4.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	3	0.4%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	13	0.5%	4	0.5%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	30	1.1%	4	0.5%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	188	6.9%	24	3.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	6	0.2%	2	0.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	7	0.3%	1	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	27	1.0%	25	3.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.2%	2	0.3%
FUNDUS				
97.120 COLOBOMA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	18	2.4%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	3	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	134	4.9%	33	4.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	25	0.9%	10	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.1%	4	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	5	0.2%	3	0.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	8	0.3%	1	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS	4	0.1%	3	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	15	0.5%	6	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	20	0.7%	8	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	8	0.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.1%	3	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.1%	2	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	5	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	8	0.3%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	6	0.2%	1	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	9	0.3%	7	0.9%
100.330 GENERALIZED/ COMPLETE CATARACT	3	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***121***	***4.4%***	***42***	***5.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	4	0.1%	1	0.1%
110.135 PHPV/ PTVL	4	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	3	0.4%

OCULAR DISORDERS REPORT
FIELD SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,738 #	 %	Year Examined: 2018-2022 Total # Dogs: 751 #	 %
VITREOUS Continued				
110.320 VITREOUS DEGENERATION SYNERESIS	2	0.1%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	276	10.1%	17	2.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	12	0.4%	1	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	4	0.1%	1	0.1%
120.400 RETINAL HEMORRHAGE	4	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	0	0.0%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	3	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	0	0.0%	2	0.3%
OTHER				
900.000 OTHER, UNSPECIFIED	47	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED	61	2.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	76	2.8%	23	3.1%
NORMAL				
.000 NORMAL GLOBE	1,967	71.8%	571	76.0%

FILA BRASILEIRO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the FILA BRASILEIRO breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
FILA BRASILEIRO

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	4		0	
Diagnostic Name		#	%	#	%
OTHER					
900.000	OTHER, UNSPECIFIED	1	25.0%	0	
NORMAL					
.000	NORMAL GLOBE	4	100.0%	0	

FINNISH LAPPHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC TESTS AVAILABLE
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
B.	Cataract	Not defined	1	NO	
C.	Retinal atrophy				
	- (*prcd)*	Autosomal recessive	2	NO	Mutation in the *prcd* gene
D.	Multifocal retinopathy - *cmr3*	Autosomal recessive	3, 4	NO (Breeder option with Normal DNA test for CMR)	Mutation in the *BEST1* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the form of PRA in the Finnish Lapphund is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the

disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

D. Multifocal retinopathy (*cmr3*)

Canine Multifocal Retinopathy type 3 (*cmr3*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Clinically the disease is similar to that seen in the Bullmastiff and Coton deTulear, but the mutation in the Bestrophin 1 gene (*BEST1* alias *VMD2*) is different. The multifocal retinopathy seen in the Lapponian Herder is caused by a deletion at position 1,388 and a substitution at position 1,466 and is therefore called *cmr3*. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563. PMID: 16938425

3. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci.* 2007 May;48:1959-1967. PMID: 17460247

4. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650; PMCID: PMC4985128.

OCULAR DISORDERS REPORT
FINNISH LAPPHUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 602 #	 %	Year Examined: 2018-2022 Total # Dogs: 238 #	 %
EYELIDS				
25.110 DISTICHIASIS	1	0.2%	1	0.4%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.4%
CORNEA				
70.220 PIGMENTARY KERATITIS	1	0.2%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	62	10.3%	19	8.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	1.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	4	0.7%	7	2.9%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	40	6.6%	14	5.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	6	1.0%	2	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	10	1.7%	3	1.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.2%	3	1.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.7%	3	1.3%
100.306 PUNCTATE CATARACT, NUCLEUS	3	0.5%	1	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	4	0.7%	4	1.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.2%	1	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.2%	5	2.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.3%	1	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	3	1.3%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.3%	2	0.8%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES	1	0.2%	2	0.8%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.2%	1	0.4%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***35***	***5.8%***	***32***	***13.4%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.2%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.4%
130.150 OPTIC DISC COLOBOMA	0	0.0%	1	0.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	10	1.7%	1	0.4%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.2%	0	0.0%
120.960 RETINOPATHY	1	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	10	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED	14	2.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	10	1.7%	6	2.5%
NORMAL				
.000 NORMAL GLOBE	488	81.1%	179	75.2%

FINNISH SPITZ

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- lens pigment foci/no strands	Not defined	1	Passes with no notation

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
FINNISH SPITZ

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 250 #	 %	2018-2022 25 #	 %
EYELIDS				
20.140 ECTOPIC CILIA	1	0.4%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	2	0.8%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	0.8%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	1.2%	8	32.0%
LENS				
100.200 CATARACT, UNSPECIFIED	1	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	33	13.2%	3	12.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.8%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.4%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	2	0.8%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.4%	3	12.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.4%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	4.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***9***	***3.6%***	***4***	***16.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	4	1.6%	1	4.0%
110.320 VITREOUS DEGENERATION SYNERESIS	3	1.2%	1	4.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	0.8%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	6	2.4%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	3	1.2%	0	0.0%
900.100 OTHER, NOT INHERITED	8	3.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	0.8%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	197	78.8%	13	52.0%

FLAT-COATED RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2-4	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Y-suture tip opacity	Not defined	1	Breeder option

Description and Comments

A. Glaucoma (with pectinate ligament abnormality)

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

Flat-Coated Retrievers have been shown to have a higher prevalence of pectinate ligament abnormalities compared with other breeds. There is a significant association between pectinate ligament abnormalities and glaucoma in this breed. The heritability of pectinate ligament abnormalities in Flat-Coated Retrievers is estimated at 0.7. Since glaucoma and pectinate ligament abnormalities are closely associated, glaucoma may also be heritable.

In a recent report, pectinate ligament abnormalities were prevalent and significantly associated with age in a population of Flat-Coated Retrievers in the UK.

Due to the incidence of PLD in the breed and the increased progression observed with age, it may be prudent to perform repeated gonioscopy examinations over time.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

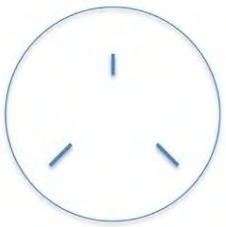
Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The exact frequency and significance of cataracts in the breed is not known.

E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Read RA, Wood JL, Lakhani KH, Read RA. Pectinate ligament dysplasia (PLD) and glaucoma in Flat-Coated Retrievers. I. Objectives, technique and results of a PLD survey. *Vet Ophthalmol*. 1998;1:85-90. PMID: 11397215

3. Read RA, Wood JL, Lakhani KH, Read RA. Pectinate ligament dysplasia (PLD) and glaucoma in Flat-Coated Retrievers. II. Assessment of prevalence and heritability. *Vet Ophthalmol*. 1998;1:91-99. PMID: 11397216

4. Oliver JA, Ekiri A, Mellersh CS. Prevalence of pectinate ligament dysplasia and associations with age, sex and intraocular pressure in the Basset Hound, Flat-Coated Retriever and Dandie Dinmont Terrier. Can Genet Epidemiol 2016 March 12;3:1doi: 10.1186/s40575-016-0033-1. PMID: 26973793

OCULAR DISORDERS REPORT
FLAT-COATED RETRIEVER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	9,513		1,857	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	3	0.0%	0	0.0%
10.000	GLAUCOMA	2	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	9	0.1%	2	0.1%
20.160	MACROPALPEBRAL FISSURE	2	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	19	0.2%	6	0.3%
22.000	ECTROPION, UNSPECIFIED	35	0.4%	1	0.1%
25.110	DISTICHIASIS	1,194	12.6%	261	14.1%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	1	0.0%	0	0.0%
51.100	THIRD EYELID CARTILAGE ANOMALY	0	0.0%	1	0.1%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	4	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	0	0.0%	1	0.1%
70.220	PIGMENTARY KERATITIS	2	0.0%	1	0.1%
70.700	CORNEAL DYSTROPHY	58	0.6%	11	0.6%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	3	0.0%	1	0.1%
UVEA					
93.110	IRIS HYPOPLASIA	2	0.0%	0	0.0%
93.120	IRIS CYST	28	0.3%	3	0.2%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	2	0.0%	3	0.2%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	250	2.6%	66	3.6%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	14	0.1%	1	0.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	3	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	90	0.9%	67	3.6%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.1%	0	0.0%
93.810	UVEAL MELANOMA	4	0.0%	0	0.0%
95.120	CILIARY BODY CYST	0	0.0%	2	0.1%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
97.120	COLOBOMA	1	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	3	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
120.960	RETINOPATHY	0	0.0%	2	0.1%
130.110	MICROPAPILLA	0	0.0%	3	0.2%
130.150	OPTIC DISC COLOBOMA	0	0.0%	4	0.2%
LENS					
100.200	CATARACT, UNSPECIFIED	16	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,103	11.6%	284	15.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	301	3.2%	182	9.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	31	0.3%	8	0.4%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	14	0.1%	8	0.4%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	41	0.4%	25	1.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	69	0.7%	50	2.7%
100.306	PUNCTATE CATARACT, NUCLEUS	24	0.3%	30	1.6%
100.307	PUNCTATE CATARACT, CAPSULAR	58	0.6%	26	1.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	50	0.5%	17	0.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	25	0.3%	6	0.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	21	0.2%	10	0.5%

OCULAR DISORDERS REPORT
FLAT-COATED RETRIEVER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 9,513 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,857 #	 %
LENS Continued				
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	7	0.1%	4	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	13	0.1%	5	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	10	0.1%	6	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR	9	0.1%	6	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	59	0.6%	66	3.6%
100.330 GENERALIZED/ COMPLETE CATARACT	8	0.1%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***703***	***7.4%***	***383***	***20.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	15	0.2%	9	0.5%
110.135 PHPV/ PTVL	5	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	2	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	1	0.0%	4	0.2%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	21	0.2%	5	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	13	0.1%	2	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	54	0.6%	2	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	2	0.1%
120.960 RETINOPATHY	23	0.2%	9	0.5%
OPTIC NERVE				
130.110 MICROPAPILLA	8	0.1%	1	0.1%
130.120 OPTIC NERVE HYPOPLASIA	3	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	26	0.3%	4	0.2%
OTHER				
900.000 OTHER, UNSPECIFIED	160	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED	272	2.9%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	226	2.4%	131	7.1%
NORMAL				
.000 NORMAL GLOBE	7,049	74.1%	1,106	59.6%

FRENCH BULLDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
D.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to cornea	Not defined	1	NO	
	- endothelial opacity/no strands	Not defined	1	NO	
F.	Cataract	Autosomal recessive	1, 2	NO	Mutation in the *HSF4* gene
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of the dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

C. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid

margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the French Bulldog, the condition is inherited as an autosomal recessive mutation in the *HSF4* gene (*HSF4-1*). A DNA test is available.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol*. 2006;9:369-378. PMID: 16939467

OCULAR DISORDERS REPORT
FRENCH BULLDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4,742 #	%	Year Examined: 2018-2022 Total # Dogs: 3,010 #	%
GLOBE				
.110 MICROPHTHALMIA	2	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	5	0.2%
20.160 MACROPALPEBRAL FISSURE	3	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	47	1.0%	46	1.5%
22.000 ECTROPION, UNSPECIFIED	7	0.1%	1	0.0%
25.110 DISTICHIASIS	310	6.5%	155	5.1%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	23	0.8%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	49	1.0%	26	0.9%
40.910 KERATOCONJUNCTIVITIS SICCA	4	0.1%	0	0.0%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	2	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	7	0.1%	5	0.2%
CORNEA				
70.210 PANNUS	4	0.1%	1	0.0%
70.220 PIGMENTARY KERATITIS	28	0.6%	13	0.4%
70.700 CORNEAL DYSTROPHY	36	0.8%	31	1.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	6	0.1%	1	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	0	0.0%	3	0.1%
93.120 IRIS CYST	9	0.2%	2	0.1%
93.150 IRIS COLOBOMA	1	0.0%	3	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	130	2.7%	69	2.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	7	0.1%	1	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	64	1.3%	17	0.6%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	3	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	11	0.2%	4	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	45	0.9%	47	1.6%
93.810 UVEAL MELANOMA	2	0.0%	0	0.0%
95.120 CILIARY BODY CYST	1	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	105	2.2%	49	1.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	24	0.5%	20	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	12	0.3%	4	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	16	0.3%	6	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.1%	2	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	6	0.1%	2	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS	12	0.3%	10	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR	7	0.1%	19	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	46	1.0%	23	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	16	0.3%	6	0.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	21	0.4%	5	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	4	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	14	0.3%	5	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	8	0.2%	8	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	8	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	3	0.1%

OCULAR DISORDERS REPORT
FRENCH BULLDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4,742 #	 %	Year Examined: 2018-2022 Total # Dogs: 3,010 #	 %
LENS Continued				
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	2	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	3	0.1%	5	0.2%
100.328 Y-SUTURE TIP OPACITIES	2	0.0%	4	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT	18	0.4%	2	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***216***	***4.6%***	***131***	***4.4%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	24	0.5%	17	0.6%
110.135 PHPV/ PTVL	1	0.0%	2	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	12	0.3%	6	0.2%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	17	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	5	0.2%
120.190 RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	109	2.3%	24	0.8%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	13	0.3%	7	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.0%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	2	0.0%	1	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	65	1.4%	0	0.0%
900.100 OTHER, NOT INHERITED	92	1.9%	7	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	93	2.0%	120	4.0%
NORMAL				
.000 NORMAL GLOBE	3,826	80.7%	2,367	78.6%

FRENCH POINTER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the FRENCH POINTER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
FRENCH POINTER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1 #	 %	Year Examined: 2018-2022 Total # Dogs: 3 #	 %
LENS				
100.328 Y-SUTURE TIP OPACITIES	1	100.0%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	0	0.0%	3	100.0%

FRENCH SPANIEL

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the FRENCH SPANIEL breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
FRENCH SPANIEL

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 2 #	 %	Year Examined: 2018-2022 Total # Dogs: 28 #	 %
GLOBE					
.110	MICROPHTHALMIA	1	50.0%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	0	0.0%	2	7.1%
UVEA					
93.110	IRIS HYPOPLASIA	0	0.0%	1	3.6%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	2	7.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	50.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	3.6%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	2	7.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	50.0%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	50.0%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	50.0%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	1	50.0%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	1	50.0%	1	3.6%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	1	3.6%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	2	7.1%
100.317	INCIPIENT CATARACT, CAPSULAR	0	0.0%	1	3.6%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***5***	***250.0%***	***5***	***17.9%***
VITREOUS					
110.320	VITREOUS DEGENERATION SYNERESIS	1	50.0%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	3	150.0%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	3.6%
NORMAL					
.000	NORMAL GLOBE	0	0.0%	19	67.9%

GERMAN LONGHAIRED POINTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataracts

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Boillot T, Rosolen SG, Dulaurent T, Goulle F, Thomas P, Isard PF, Azoulay T, Lafarge-Beurlet S, Woods M, Lavillegrand S, Ivkovic I, Neveux N, Sahel JA, Picaud S, Froger N. Determination of morphological, biometric and biochemical susceptibilities in healthy Eurasier dogs with suspected inherited glaucoma. PLoS One. 2014 Nov 7;9(11):e111873. doi: 10.1371/journal.pone.0111873. PMID: 25380252

3. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol*. 2011;14:121-126. Epub 2011/03/04. PMID: 21366828

4. Rosolen SG, Boillot T, Dulaurent T, et al. Morphological, biometrical and biochemical susceptibilities for glaucoma in a healthy Eurasier dog - ECVO 2014 abstract #44. *Vet Ophthalmol*. 2014;17:E23.

OCULAR DISORDERS REPORT
GERMAN LONGHAIRED POINTER

Diagnostic Name	1993-2017 #	1993-2017 %	2018-2022 #	2018-2022 %
Year Examined:	**1993-2017**		**2018-2022**	
Total # Dogs:	**12**		**24**	
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	0	0.0%	1	4.2%
UVEA				
93.120 IRIS CYST	1	8.3%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	16.7%	1	4.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	8.3%	1	4.2%
LENS				
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	2	8.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	2	8.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	2	8.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	8.3%	1	4.2%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***8.3%***	***7***	***29.2%***
VITREOUS				
110.320 VITREOUS DEGENERATION SYNERESIS	0	0.0%	1	4.2%
OTHER				
900.000 OTHER, UNSPECIFIED	1	8.3%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	8	66.7%	17	70.8%

GERMAN PINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder Option
B.	Persistent pupillary membranes			
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO
D.	Persistent hyperplastic tunica vasculosa lentis (PHTVL)	Not defined	2, 3	NO
E.	Micropapilla	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of the dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

There may be more than one type of inherited cataract in German Pinschers. One form is reported in Finland with a later age of onset in which a pedigree analysis suggested autosomal recessive or incomplete dominant inheritance (4). Another form is reported in Germany with an earlier age of onset in which a pedigree analysis suggested autosomal recessive inheritance (5). Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent tunica vasculosa lentis results from the failure of regression of the embryologic vascular network which surrounds the developing lens. This disorder has been observed in German Pinschers in Finland and Germany. A pedigree analysis suggested recessive or incomplete dominant inheritance (4).

E. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Leppanen M, Martenson J, Maki K. Results of ophthalmologic screening examinations of German Pinschers in Finland--a retrospective study. *Vet Ophthalmol*. 2001;4:165-169. PMID: 11722779

3. Pfahler S, Menzel J, Brahm R, et al. Prevalence and formation of primary cataracts and persistent hyperplastic tunica vasculosa lentis in the German Pinscher population in Germany. *Vet Ophthalmol*. 2015;18:135-140. PMID: 24674602

OCULAR DISORDERS REPORT
GERMAN PINSCHER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,330 #	 %	Year Examined: 2018-2022 Total # Dogs: 341 #	 %
EYELIDS				
25.110 DISTICHIASIS	8	0.6%	6	1.8%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	0	0.0%	2	0.6%
70.700 CORNEAL DYSTROPHY	20	1.5%	1	0.3%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	10	0.8%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	5	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	19	1.4%	7	2.1%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	89	6.7%	25	7.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	29	2.2%	12	3.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	32	2.4%	6	1.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	1	0.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	9	0.7%	2	0.6%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	11	0.8%	2	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS	5	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	10	0.8%	7	2.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	29	2.2%	4	1.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	42	3.2%	6	1.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	9	0.7%	5	1.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	6	0.5%	1	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	9	0.7%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	8	0.6%	2	0.6%
100.317 INCIPIENT CATARACT, CAPSULAR	10	0.8%	4	1.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	3	0.9%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.2%	4	1.2%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.1%	1	0.3%
100.326 INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.3%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	2	0.6%
100.328 Y-SUTURE TIP OPACITIES	6	0.5%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	9	0.7%	1	0.3%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***223***	***16.8%***	***64***	***18.8%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	0.2%	0	0.0%
110.135 PHPV/ PTVL	4	0.3%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	16	1.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	0.2%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.1%	0	0.0%
120.960 RETINOPATHY	2	0.2%	0	0.0%
FUNDUS				
120.970 CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.3%
OPTIC NERVE				
130.110 MICROPAPILLA	11	0.8%	4	1.2%
130.120 OPTIC NERVE HYPOPLASIA	7	0.5%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	26	2.0%	0	0.0%
900.100 OTHER, NOT INHERITED	32	2.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	32	2.4%	24	7.0%

OCULAR DISORDERS REPORT
GERMAN PINSCHER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,330 #	%	2018-2022 341 #	%
NORMAL				
.000 NORMAL GLOBE	1,062	79.8%	252	73.9%

GERMAN SHEPHERD DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Plasmoma/atypical pannus	Not defined	1	NO	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1, 2	Breeder option	
D.	Chronic superficial keratitis/pannus	Not defined	1, 3-9	NO	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
F.	Cataract				
	- cortical	Presumed autosomal recessive	1, 10	NO	
G.	Y-suture tip opacities	Not defined	1	Breeder option	
H.	Cone degeneration - achromatopsia	Autosomal recessive	11	NO	Mutation in the *CNGA3* gene
I.	Retinal dysplasia				
	- folds	Not defined	1, 12	Breeder option	
J.	Micropapilla	Not defined	1	Breeder option	
K.	Limbal melanoma	Not defined	13	NO	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Plasmoma/atypical pannus

Bilateral lymphocytic/plasmocytic infiltration of the nictitating membranes which may occur independent of corneal Pannus.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans which may also occur independent of corneal disease.

The German Shepherd Dog has a higher incidence of pannus than any other breed. The MHC class II risk haplotype has been shown. Although there are likely several other genes and environmental factors that contribute to CSK, a recent paper suggested that MHC class II is a major genetic risk factor. Dogs with the risk haplotype were 2.7 times more likely to develop CSK. Homozygosity of the risk haplotype increased the risk of CSK to over eightfold.

E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

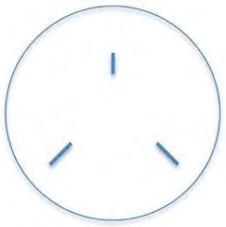
- cortical

Reported by Barnett in Great Britain, opacities are first apparent at 8-12 weeks of age, in the posterior cortex and progress to involve the Y-sutures and nucleus. The equatorial subcapsular cortex is unaffected. No progression is noted after 1-2 years of age. Test breeding suggests an autosomal recessive mode of inheritance.

G. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above)

suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

H. Cone degeneration - achromatopsia

Autosomal recessively inherited early degeneration of the cone photoreceptors. Afflicted puppies develop day-blindness and color blindness. Afflicted dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A single, 5-month-old German Shepherd puppy with vision loss during daylight hours was identified with a mutation in the *CNGA3* gene.

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

J. Micropapilla

Micropapilla refers to a congenital anomaly which results in a small optic disk diameter without vision loss. Contrast with optic nerve hypoplasia, which may have a similar ophthalmoscopic appearance with vision loss.

K. Limbal melanoma

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predisposition have been noted in the German Shepherd, Labrador and Golden Retriever.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Crispin SM, Barnett KC. Dystrophy, degeneration and infiltration of the canine cornea. *J Small Anim*

Pract. 1983;24:63-83.

3. Campbell LH, Okuda HK, Lipton DE, et al. Chronic superficial keratitis in dogs: detection of cellular hypersensitivity. *Am J Vet Res*. 1975;36:669-671. PMID: 1169896

4. Slatter DH, Lavach JD, Severin GA, et al. Uberreiter's syndrome (chronic superficial keratitis) in dogs in the Rocky Mountain area--a study of 463 cases. *J Small Anim Pract*. 1977;18:757-772. PMID: 599907

5. Uberreiter O. A particular form of keratitis [chronic superficial keratitis] in dogs. *Wien Tierarztl Mschr*. 1961;48:65.

6. Drahenmann A. Auto-immune phenomenon in chronic superficial keratitis (Uberreiter) in Shepherd dogs. In: *The Cornea in Health and Disease* (ed. Roper, T.). The Royal Society of Medicine, Academic Press, Grune & Stratton; London, 1981;261.

7. Bedford PG, Longstaffe JA. Corneal pannus (chronic superficial keratitis) in the German Shepherd Dog. *J Small Anim Pract*. 1979;20:41-56. PMID: 759720

8. Eichenbaum JD, Lavach JD, Gould DH, et al. Immunohistochemical staining patterns of canine eyes affected with chronic superficial keratitis. *Am J Vet Res*. 1986;47:1952-1955. PMID: 3767102

9. Jokinen P, Rusanen EM, Kennedy LJ, et al. MHC class II risk haplotype associated with canine chronic superficial keratitis in German Shepherd Dogs. *Vet Immunol Immunopathol*. 2011;140:37-41. PMID: 21144596

10. Barnett KC. Hereditary cataract in the German Shepherd Dog. *J Small Anim Pract*. 1986;27:387-395.

11. Tanaka N, Dutrow EV, Miyadera K, et al. Canine CNGA3 gene mutations provide novel insights into human achromatopsia-associated channelopathies and treatment. *PLoS One*. 2015;10:e0138943. PMID: 26407004

12. Iwabe, S., et al. (2020). "Focal/multifocal and geographic retinal dysplasia in the dog-In vivo retinal microanatomy analyses." Vet Ophthalmol 23(2): 292-304. PMID: 31746146

13. Martin CL. Canine epibulbar melanoma. *J Am Anim Hosp Assoc*. 1981;17:83-90.

OCULAR DISORDERS REPORT
GERMAN SHEPHERD DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 5,099 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,060 #	 %
GLOBE				
.110 MICROPHTHALMIA	9	0.2%	0	0.0%
10.000 GLAUCOMA	3	0.1%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	3	0.1%	3	0.3%
22.000 ECTROPION, UNSPECIFIED	4	0.1%	0	0.0%
25.110 DISTICHIASIS	56	1.1%	5	0.5%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	3	0.1%	0	0.0%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	15	0.3%	12	1.1%
51.100 THIRD EYELID CARTILAGE ANOMALY	4	0.1%	1	0.1%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	116	2.3%	17	1.6%
70.220 PIGMENTARY KERATITIS	2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	234	4.6%	56	5.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	2	0.0%	0	0.0%
UVEA				
93.120 IRIS CYST	23	0.5%	2	0.2%
93.170 ANTERIOR CHAMBER CYST	2	0.0%	3	0.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	70	1.4%	25	2.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	16	0.3%	2	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	9	0.2%	4	0.4%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	3	0.1%	1	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	16	0.3%	10	0.9%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	2	0.2%
93.810 UVEAL MELANOMA	2	0.0%	1	0.1%
95.120 CILIARY BODY CYST	1	0.0%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	5	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.1%
120.970 CMR/ CMR-LIKE RETINOPATHY	0	0.0%	2	0.2%
130.110 MICROPAPILLA	0	0.0%	7	0.7%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	2	0.2%
130.150 OPTIC DISC COLOBOMA	0	0.0%	2	0.2%
LENS				
100.200 CATARACT, UNSPECIFIED	28	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	273	5.4%	87	8.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	46	0.9%	16	1.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	17	0.3%	2	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	19	0.4%	2	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.0%	3	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	28	0.5%	21	2.0%
100.306 PUNCTATE CATARACT, NUCLEUS	56	1.1%	37	3.5%
100.307 PUNCTATE CATARACT, CAPSULAR	19	0.4%	11	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	39	0.8%	6	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	34	0.7%	7	0.7%

OCULAR DISORDERS REPORT
GERMAN SHEPHERD DOG

Diagnostic Name	1993-2017 #	1993-2017 %	2018-2022 #	2018-2022 %
Year Examined:	**1993-2017**		**2018-2022**	
Total # Dogs:	**5,099**		**1,060**	
LENS Continued				
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	21	0.4%	5	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	5	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	8	0.2%	2	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS	76	1.5%	20	1.9%
100.317 INCIPIENT CATARACT, CAPSULAR	8	0.2%	9	0.8%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.0%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	2	0.0%	2	0.2%
100.327 INCOMPLETE CATARACT, CAPSULAR	2	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	14	0.3%	21	2.0%
100.330 GENERALIZED/ COMPLETE CATARACT	22	0.4%	4	0.4%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	8	0.2%	1	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***436***	***8.6%***	***151***	***14.2%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	8	0.2%	1	0.1%
110.135 PHPV/ PTVL	3	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	5	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	11	0.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	97	1.9%	5	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	19	0.4%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	21	0.4%	1	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	4	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	0	0.0%
120.960 RETINOPATHY	2	0.0%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	31	0.6%	6	0.6%
130.120 OPTIC NERVE HYPOPLASIA	35	0.7%	2	0.2%
130.150 OPTIC DISC COLOBOMA	4	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	58	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	146	2.9%	4	0.4%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	105	2.1%	59	5.6%
NORMAL				
.000 NORMAL GLOBE	3,876	76.0%	750	70.8%

GERMAN SHORTHAIRED POINTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Not defined	1	NO	
D.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
E.	Cone degeneration - (achromatopsia)	Autosomal recessive	2, 3	NO	Mutation in the *CNGB3* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

E. Cone degeneration - hemeralopia/achromatopsia

Autosomal recessively inherited early degeneration of the cone photoreceptors. Afflicted puppies develop day-blindness, color blindness, and photophobia between 8 and 12 weeks of age. Afflicted dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A missense mutation in the same gene (CNGB3) that has been identified in CD-affected Alaskan Malamute-derived dogs has been detected in German Shorthaired Pointers affected with a clinically identical allelic disorder. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Sidjanin DJ, Lowe JK, McElwee JL, et al. Canine CNGB3 mutations establish cone degeneration as orthologous to the human achromatopsia locus ACHM3. Human Molecular Genetics. 2002;11:1823-1833. PMID: 12140184

3. Yeh CY, Goldstein O, Kukekova AV, Holley D, Knollinger AM, Huson HJ, Pearce-Kelling SE, Acland GM, Komáromy AM. Genomic deletion of CNGB3 is identical by descent in multiple canine breeds and causes achromatopsia. BMC Genet. 2013 Apr 20;14:27. doi: 10.1186/1471-2156-14-27. PMID: 23601474

OCULAR DISORDERS REPORT
GERMAN SHORTHAIRED POINTER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	7,003		2,185	
	Diagnostic Name	#	%	#	%
GLOBE					
10.000	GLAUCOMA	1	0.0%	0	0.0%
EYELIDS					
20.160	MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	10	0.1%	9	0.4%
22.000	ECTROPION, UNSPECIFIED	4	0.1%	1	0.0%
25.110	DISTICHIASIS	273	3.9%	108	4.9%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	3	0.0%	2	0.1%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	1	0.0%
CORNEA					
70.210	PANNUS	1	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	20	0.3%	2	0.1%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	2	0.0%	1	0.0%
93.120	IRIS CYST	7	0.1%	2	0.1%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150	IRIS COLOBOMA	2	0.0%	1	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	475	6.8%	153	7.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	18	0.3%	1	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	7	0.1%	2	0.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	30	0.4%	24	1.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.1%	0	0.0%
93.810	UVEAL MELANOMA	1	0.0%	0	0.0%
95.120	CILIARY BODY CYST	1	0.0%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	14	0.6%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.0%
120.960	RETINOPATHY	0	0.0%	1	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	9	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	351	5.0%	89	4.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	54	0.8%	26	1.2%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	56	0.8%	19	0.9%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	17	0.2%	7	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	6	0.1%	6	0.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	27	0.4%	10	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	42	0.6%	32	1.5%
100.307	PUNCTATE CATARACT, CAPSULAR	28	0.4%	20	0.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	20	0.3%	6	0.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	99	1.4%	19	0.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	21	0.3%	5	0.2%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.0%	0	0.0%

OCULAR DISORDERS REPORT
GERMAN SHORTHAIRED POINTER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 7,003 #	 %	Year Examined: 2018-2022 Total # Dogs: 2,185 #	 %
LENS Continued				
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	18	0.3%	5	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS	25	0.4%	11	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	15	0.2%	8	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	2	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	8	0.1%	1	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	2	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.0%
100.328 Y-SUTURE TIP OPACITIES	11	0.2%	14	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT	14	0.2%	2	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***468***	***6.7%***	***182***	***8.3%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	19	0.3%	21	1.0%
110.135 PHPV/ PTVL	15	0.2%	2	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	23	0.3%	9	0.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	137	2.0%	11	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	26	0.4%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	9	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	3	0.0%	0	0.0%
120.960 RETINOPATHY	7	0.1%	1	0.0%
120.970 CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	3	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	5	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	99	1.4%	0	0.0%
900.100 OTHER, NOT INHERITED	136	1.9%	2	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	105	1.5%	93	4.3%
NORMAL				
.000 NORMAL GLOBE	5,631	80.4%	1,644	75.2%

GERMAN SPANIEL

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the GERMAN SPANIEL breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
GERMAN SPANIEL

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		0	
Diagnostic Name		**#**	**%**	**#**	**%**
NORMAL					
.000 NORMAL GLOBE		1	100.0%	0	

GERMAN SPITZ

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent hyaloid artery remnant	Not defined	1	Breeder option

Description and Comments

A. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
GERMAN SPITZ

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 6 #	 %	2018-2022 53 #	 %
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	16.7%	1	1.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	0	0.0%	1	1.9%
LENS				
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.9%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.9%
100.330 GENERALIZED/ COMPLETE CATARACT	0	0.0%	1	1.9%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***0***	***0.0%***	***3***	***5.7%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	9	17.0%
110.135 PHPV/ PTVL	0	0.0%	1	1.9%
RETINA				
120.960 RETINOPATHY	1	16.7%	0	0.0%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	1.9%
NORMAL				
.000 NORMAL GLOBE	5	83.3%	39	73.6%

GERMAN WIREHAIRED POINTER

(Drathaar, Deutsch Drathaar)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
GERMAN WIREHAIRED POINTER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	845		393	
	Diagnostic Name	#	%	#	%
EYELIDS					
20.160	MACROPALPEBRAL FISSURE	1	0.1%	0	0.0%
25.110	DISTICHIASIS	13	1.5%	4	1.0%
CORNEA					
70.730	CORNEAL ENDOTHELIAL DEGENERATION	0	0.0%	1	0.3%
UVEA					
93.110	IRIS HYPOPLASIA	1	0.1%	1	0.3%
93.120	IRIS CYST	0	0.0%	1	0.3%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	17	2.0%	19	4.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	0	0.0%	2	0.5%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	0	0.0%
93.810	UVEAL MELANOMA	0	0.0%	1	0.3%
LENS					
100.200	CATARACT, UNSPECIFIED	5	0.6%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	26	3.1%	14	3.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.2%	4	1.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	7	0.8%	1	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.4%	2	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.6%	3	0.8%
100.307	PUNCTATE CATARACT, CAPSULAR	7	0.8%	2	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.4%	3	0.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	12	1.4%	6	1.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.1%	1	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	3	0.4%	2	0.5%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	2	0.2%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	2	0.2%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***53***	***6.3%***	***25***	***6.4%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.2%	2	0.5%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	3	0.4%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	3	0.4%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.2%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	9	1.1%	0	0.0%
900.100	OTHER, NOT INHERITED	8	0.9%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	18	2.1%	12	3.1%
NORMAL					
.000	NORMAL GLOBE	735	87.0%	339	86.3%

GIANT SCHNAUZER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
B.	Cataract	Not defined	1	NO	
C.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
D.	Retinal atrophy				
D.	- (*prcd*)	Autosomal recessive	2	NO	Mutation in the *prcd* gene
	- *NECAP1*	Autosomal recessive	3	NO	Mutation in the *NECAP1* gene
E.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

D. Retinal atrophy

- prcd

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A genetic test is available.

- NECAP1

In addition, another mutation in the *NECAP1* gene has been identified in Giant Schnauzers with PRA. Proposed mode of inheritance is autosomal recessive, and affected animals presented with clinical signs of PRA at 4-5 years of age.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Personal communication on data from Optigen with Sue Pearce-Kelling

3. Hitti, R. J., et al. (2019). "Whole Genome Sequencing of Giant Schnauzer Dogs with Progressive Retinal Atrophy Establishes NECAP1 as a Novel Candidate Gene for Retinal Degeneration." Genes (Basel) 10(5). PMID: 31117272

OCULAR DISORDERS REPORT
GIANT SCHNAUZER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,285		488	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.1%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	0	0.0%	2	0.4%
25.110	DISTICHIASIS	6	0.5%	2	0.4%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.1%	1	0.2%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	11	0.9%	2	0.4%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.2%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	1	0.1%	3	0.6%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
UVEA					
93.120	IRIS CYST	2	0.2%	1	0.2%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	60	4.7%	12	2.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	4	0.3%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.5%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	0	0.0%	1	0.2%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	12	0.9%	17	3.5%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
95.120	CILIARY BODY CYST	1	0.1%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	5	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	62	4.8%	25	5.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	10	0.8%	9	1.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	9	0.7%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.2%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	1	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	5	0.4%	4	0.8%
100.306	PUNCTATE CATARACT, NUCLEUS	3	0.2%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	19	1.5%	13	2.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.2%	2	0.4%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	26	2.0%	4	0.8%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	8	0.6%	2	0.4%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	4	0.3%	1	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	3	0.2%	1	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	4	0.3%	4	0.8%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.2%
100.328	Y-SUTURE TIP OPACITIES	6	0.5%	4	0.8%
100.330	GENERALIZED/ COMPLETE CATARACT	2	0.2%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.2%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***102***	***7.9%***	***43***	***8.8%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	6	0.5%	7	1.4%
110.135	PHPV/ PTVL	5	0.4%	1	0.2%
110.320	VITREOUS DEGENERATION SYNERESIS	2	0.2%	0	0.0%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.4%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.4%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	27	2.1%	2	0.4%

OCULAR DISORDERS REPORT
GIANT SCHNAUZER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,285		488	
	Diagnostic Name	#	%	#	%
RETINA Continued					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.2%	1	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	8	0.6%	0	0.0%
120.960	RETINOPATHY	2	0.2%	0	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	1	0.1%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	26	2.0%	0	0.0%
900.100	OTHER, NOT INHERITED	19	1.5%	1	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	17	1.3%	23	4.7%
NORMAL					
.000	NORMAL GLOBE	1,073	83.5%	396	81.1%

GLEN OF IMAAL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Retinal atrophy				
	- Cone rod dystrophy (*crd3*)	Autosomal recessive	2, 3	NO	Mutation in the *ADAM9* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Cone rod dystrophy

A form of late-onset PRA identified in Glen of Imaal Terriers. Ophthalmoscopic lesions are typically diagnosed by 5 years of age, however lesions may be present as early as 3 years of age in affected dogs. Two distinct phenotypes are observed in affected Glen of Imaal Terriers. The most common phenotype is subtle but generalized tapetal hyperreflectivity and retinal vascular attenuation that progresses over 1 - 2 years after initial examination. The less common phenotype is a focal mid-temporal (area centralis) area of distinct tapetal hyperreflectivity without generalized retinal disease. This lesion may remain unchanged for over a year but will progress to generalized retinal atrophy by 2 - 4 years after initial examination. ERG dysfunction can be observed as early as 15 weeks of age. The disorder is caused by a mutation present in the *ADAM9* gene. A DNA test is available that will unequivocally identify normal, affected, and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Goldstein O, Mezey JG, Boyko AR, et al. An *ADAM9* mutation in canine cone-rod dystrophy 3 establishes homology with human cone-rod dystrophy 9. *Mol Vis*. 2010;16:1549-1569. PMID:

20806078

3. Kropatsch R, Petrasch-Parwez E, Seelow D, et al. Generalized progressive retinal atrophy in the Irish Glen of Imaal Terrier is associated with a deletion in the ADAM9 gene. *Mol Cell Probes*. 2010;24:357-363. PMID: 20691256

OCULAR DISORDERS REPORT
GLEN OF IMAAL TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	691		187	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.1%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	2	0.3%	0	0.0%
25.110	DISTICHIASIS	25	3.6%	9	4.8%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.1%	0	0.0%
CORNEA					
70.220	PIGMENTARY KERATITIS	0	0.0%	1	0.5%
UVEA					
93.120	IRIS CYST	2	0.3%	0	0.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	2	1.1%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.1%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	60	8.7%	3	1.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	10	1.4%	2	1.1%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.4%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.9%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.3%	1	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	3	0.4%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	4	0.6%	1	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	8	1.2%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	6	0.9%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.3%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	1	0.1%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.4%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***51***	***7.4%***	***4***	***2.1%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.3%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	2	0.3%	0	0.0%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.5%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	7	1.0%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	4	0.6%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	24	3.5%	0	0.0%
120.960	RETINOPATHY	1	0.1%	0	0.0%
OPTIC NERVE					
130.120	OPTIC NERVE HYPOPLASIA	1	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	5	0.7%	0	0.0%

OCULAR DISORDERS REPORT
GLEN OF IMAAL TERRIER

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 691 #	 %	Year Examined: 2018-2022 Total # Dogs: 187 #	 %
OTHER					
900.000	OTHER, UNSPECIFIED	12	1.7%	0	0.0%
900.100	OTHER, NOT INHERITED	13	1.9%	1	0.5%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	31	4.5%	4	2.1%
NORMAL					
.000	NORMAL GLOBE	552	79.9%	168	89.8%

GOLDEN RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmos	Autosomal recessive	2	NO	
B.	Entropion	Not defined	1	Breeder option	
C.	Distichiasis	Not defined	1	Breeder option	
D.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
E.	Uveal cysts	Not defined	1, 3-5	Breeder option	
F.	Pigmentary uveitis	Not defined	1, 3-6	NO	
G.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	7	Passes with no notation	
H.	Cataract	Not defined	1, 7-12	NO	
I.	Y-suture tip opacity	Not defined	1	Breeder option	
J.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
K.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
L.	Retinal Atrophy				
	- *(prcd)*	Autosomal recessive	1, 12, 13	NO	Mutation in the *prcd* gene
	- *PRA 1*	Autosomal recessive	14	NO	Mutation in the *SLC4A3* gene
	- *PRA 2*	Autosomal recessive	15, 16	NO	Mutation in the *TTC8* gene
M.	Retinal dysplasia				
	- folds	Not defined	1, 17	Breeder option	

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
	- geographic	Not defined	1, 17	NO	
N.	Limbal melanoma	Not defined	18	NO	

Description and Comments

A. Micropthalmos

A congenital anomaly in which the globe is abnormally small. Commonly associated with multiple ocular malformations and when severe, may affect vision.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward a head conformation that reduces or eliminates the likelihood of the defect.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

This disorder may be observed in any breed but retriever breeds tend to be predisposed. There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

F. Pigmentary uveitis

A unique uveitis observed in the Golden Retriever that is not associated with other ocular or systemic disorders. Adhesions develop between iris and lens and the peripheral iris and cornea. Pigment dispersion (exfoliation) occurs across the anterior lens capsule from the pigmented cells of the posterior iris. Other complications include secondary cataract and obstructive glaucoma. Onset is usually between 5-10 years of age.

G. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

H. Cataract

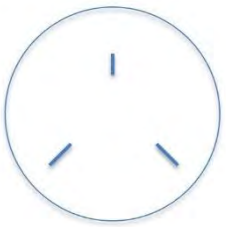
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The most common cataract reported in the Golden Retriever is a posterior polar (posterior cortical) cataract. These are generally bilateral, although an occasional unilateral affliction may be observed. These focal opacities will occasionally remain stationary. These cataracts are usually observed between 9 months and 3 years of age. A more generalized cataract is also observed in this breed and is not always associated with the previously mentioned polar cataract. There are also cataract changes involving the Y sutures which may or may not progress.

The existence of cataracts in the Golden Retriever, often with limited clinical significance, presents problems with breeder recognition as the majority of these dogs do not evidence visual impairment. It is strongly recommended that all Golden Retrievers that are used in breeding programs be examined annually as cataract changes have been observed in multiple locations of the lens and variable age of onset.

I. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips).
It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

J. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

K. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

L. Retinal atrophy

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Studies have shown that one form of PRA in the Golden Retriever is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

- PRA1 & PRA2

In addition, two other known mutations that cause PRA are present in the breed. Golden Retriever PRA 1 (GR PRA1) is an autosomal recessive trait and is the predominant form in European lines of Golden Retrievers. Golden Retriever PRA 2 (GR PRA2) has also been identified within the breed. Therefore three different DNA tests are available. However these tests will only detect these three mutations. Syndromic effects in Golden Retrievers seems to be mild.

M. Retinal dysplasia

- folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

- geographic

An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

N. Limbal melanoma

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predispositions have been noted in the German Shepherd Dog, and Labrador and Golden Retrievers.

Historical Note:

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Hug, P., et al. (2019). "A SIX6 Nonsense Variant in Golden Retrievers with Congenital Eye Malformations." Genes (Basel) 10(6). PMID: 31207931

3. Townsend WM, Gornik KR. Prevalence of uveal cysts and pigmentary uveitis in Golden Retrievers in three Midwestern states. *J Am Vet Med Assoc*. 2013;243:1298-1301. PMID: 24134580

4. Deehr AJ, Dubielzig RR. A histopathological study of iridociliary cysts and glaucoma in Golden Retrievers. *Vet Ophthalmol*. 1998;1:153-158. PMID: 11397224

5. Holly VL, Sandmeyer LS, Bauer BS, et al. Golden Retriever cystic uveal disease: a longitudinal study of iridociliary cysts, pigmentary uveitis, and pigmentary/cystic glaucoma over a decade in western Canada. *Vet Ophthalmol*. 2016;19:237-244. PMID: 26119416

6. Sapienza JS, Simo FJ, Prades-Sapienza A. Golden Retriever uveitis: 75 cases (1994-1999). *Vet Ophthalmol*. 2000;3:241-246. PMID: 11397310

7. Bona A. Eine populationgenetische Untersuchung zur Zuchtsituation und zu erblich determinierten Erkankun- insbesodere Augen- und Gelenkserkrankungen- bein Golden und Labrador Retriever. (A population genetic study of the breeding situation and inherited diseases, particularly eye and joint diseases, in the Golden and Labrador Retrievers.). *Tierarztliche Hochschule Hannover: Hannover Germany*. 1995.

8. Gelatt KN. Cataracts in the Golden Retriever dog. *Vet Med Small Anim Clin*. 1972;67:1113-1115. PMID: 4484576

9. Rubin LF. Cataract in Golden Retrievers. *J Am Vet Med Assoc*. 1974;165:457-458. PMID: 4423543

10. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract*. 1978;19:109-120. PMID: 642468

11. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract*. 1985;26:305-316.

12. Curtis R, Barnett KC. A Survey of Cataracts in Golden and Labrador Retrievers. *J Small Anim Pract*. 1989;30:277-286.

13. Gelatt KN. Description and diagnosis of progressive retinal atrophy. *Norden News*. 1974;24.

14. Downs LM, Wallin-Hakansson B, Boursnell M, et al. A frameshift mutation in golden retriever dogs with progressive retinal atrophy endorses SLC4A3 as a candidate gene for human retinal degenerations. *PloS one*. 2011;6:e21452. PMID: 21738669

15. Downs LM, Wallin-Hakansson B, Bergstrom T, et al. A novel mutation in TTC8 is associated with progressive retinal atrophy in the Golden Retriever. *Canine Genet Epidemiol*. 2014;1:4.PMID: 26401321

16. Mäkeläinen S, Hellsand M, van der Heiden AD, Andersson E, Thorsson E, S Holst B, Häggström J, Ljungvall I, Mellersh C, Hallböök F, Andersson G, Ekesten B, Bergström TF. Deletion in the Bardet-Biedl Syndrome Gene *TTC8* Results in a Syndromic Retinal Degeneration in Dogs. Genes (Basel). 2020 Sep 18;11(9):1090. doi: 10.3390/genes11091090. PMID: 32962042; PMCID: PMC7565673.

17. Iwabe, S., et al. (2020). "Focal/multifocal and geographic retinal dysplasia in the dog-In vivo retinal microanatomy analyses." Vet Ophthalmol 23(2): 292-304. PMID: 31746146

18. Donaldson D, Sansom J, Scase T, et al. Canine limbal melanoma: 30 cases (1992-2004). Part 1. Signalment, clinical and histological features and pedigree analysis. *Vet Ophthalmol*. 2006;9:115-119. PMID 16497236

OCULAR DISORDERS REPORT
GOLDEN RETRIEVER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	174,428		47,979	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	54	0.0%	8	0.0%
10.000	GLAUCOMA	33	0.0%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.0%
EYELIDS					
20.110	EYELID DERMOID	3	0.0%	0	0.0%
20.140	ECTOPIC CILIA	55	0.0%	7	0.0%
20.160	MACROPALPEBRAL FISSURE	22	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	397	0.2%	92	0.2%
22.000	ECTROPION, UNSPECIFIED	107	0.1%	14	0.0%
25.110	DISTICHIASIS	18,458	10.6%	4,141	8.6%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	17	0.0%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	52	0.0%	21	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	5	0.0%	2	0.0%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	2	0.0%	0	0.0%
51.100	THIRD EYELID CARTILAGE ANOMALY	18	0.0%	7	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	42	0.0%	1	0.0%
CORNEA					
70.210	PANNUS	11	0.0%	1	0.0%
70.220	PIGMENTARY KERATITIS	24	0.0%	10	0.0%
70.700	CORNEAL DYSTROPHY	729	0.4%	259	0.5%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	42	0.0%	5	0.0%
UVEA					
90.250	PIGMENTARY UVEITIS	1,191	0.7%	552	1.2%
93.110	IRIS HYPOPLASIA	6	0.0%	3	0.0%
93.120	IRIS CYST	7,270	4.2%	2,026	4.2%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	17	0.0%	0	0.0%
93.150	IRIS COLOBOMA	21	0.0%	2	0.0%
93.170	ANTERIOR CHAMBER CYST	1,161	0.7%	1,376	2.9%
93.180	IIRIS SPHINCTER DYSPLASIA	1	0.0%	1	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3,892	2.2%	1,324	2.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	120	0.1%	22	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	88	0.1%	11	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	111	0.1%	1	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	642	0.4%	781	1.6%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	49	0.0%	23	0.0%
93.810	UVEAL MELANOMA	32	0.0%	19	0.0%
95.120	CILIARY BODY CYST	841	0.5%	376	0.8%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	2	0.0%	1	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	9	0.0%	0	0.0%
97.120	COLOBOMA	8	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	182	0.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	96	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
120.960	RETINOPATHY	0	0.0%	12	0.0%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	3	0.0%
130.110	MICROPAPILLA	0	0.0%	2	0.0%
130.150	OPTIC DISC COLOBOMA	0	0.0%	2	0.0%

OCULAR DISORDERS REPORT
GOLDEN RETRIEVER

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 174,428 #	 %	Year Examined: 2018-2022 Total # Dogs: 47,979 #	 %
LENS					
100.200	CATARACT, UNSPECIFIED	952	0.5%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	10,723	6.1%	3,583	7.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1,778	1.0%	1,190	2.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	2,847	1.6%	750	1.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1,077	0.6%	712	1.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	211	0.1%	111	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1,083	0.6%	264	0.6%
100.306	PUNCTATE CATARACT, NUCLEUS	567	0.3%	456	1.0%
100.307	PUNCTATE CATARACT, CAPSULAR	826	0.5%	531	1.1%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1,195	0.7%	561	1.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	3,566	2.0%	912	1.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1,328	0.8%	734	1.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	85	0.0%	22	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	807	0.5%	156	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	485	0.3%	341	0.7%
100.317	INCIPIENT CATARACT, CAPSULAR	413	0.2%	227	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	69	0.0%	76	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	131	0.1%	126	0.3%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	42	0.0%	50	0.1%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	2	0.0%	3	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	16	0.0%	21	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	40	0.0%	43	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	23	0.0%	28	0.1%
100.328	Y-SUTURE TIP OPACITIES	244	0.1%	268	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	364	0.2%	35	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	8	0.0%	11	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	33	0.0%	1	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***17,915***	***10.3%***	***7,360***	***15.3%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	185	0.1%	105	0.2%
110.135	PHPV/ PTVL	38	0.0%	15	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	21	0.0%	10	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	291	0.2%	85	0.2%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	2,158	1.2%	290	0.6%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	872	0.5%	138	0.3%
120.190	RETINAL DYSPLASIA, DETACHED	40	0.0%	3	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	178	0.1%	7	0.0%
120.400	RETINAL HEMORRHAGE	18	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	28	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	4	0.0%	2	0.0%
120.960	RETINOPATHY	54	0.0%	25	0.1%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	14	0.0%	8	0.0%
130.120	OPTIC NERVE HYPOPLASIA	39	0.0%	5	0.0%
130.150	OPTIC DISC COLOBOMA	57	0.0%	11	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	1,783	1.0%	0	0.0%
900.100	OTHER, NOT INHERITED	3,049	1.7%	54	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2,897	1.7%	2,033	4.2%

OCULAR DISORDERS REPORT
GOLDEN RETRIEVER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 174,428 #	 %	Year Examined: 2018-2022 Total # Dogs: 47,979 #	 %
NORMAL				
.000 NORMAL GLOBE	129,799	74.4%	31,712	66.1%

GORDON SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Ectropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- rod-cone dysplasia type 4 (*rcd4*)	Autosomal recessive	2	NO	Mutation in the *C2orf71* gene
F.	Cone degeneration - achromatopsia	Not defined	3	NO	
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision

impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

F. Cone degeneration - achromatopsia

Suspected inherited retinal disease characterized by degeneration of the cone receptors and loss of vision in bright light. Age of onset is variable. Ophthalmoscopic examination is normal. The ERG abnormalities are more suggestive of a cone-rod dystrophy. The mode of inheritance and genetic mutation are not yet known.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

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References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. *Anim Genet*. 2012;44:169-177. PMID: 22686255

3. Good KL, Komaromy AM, Kass PH, et al. Novel retinopathy in related Gordon Setters: a clinical, behavioral, electrophysiological, and genetic investigation. *Vet Ophthalmol*. 2015:1-11. PMID: 26417729

OCULAR DISORDERS REPORT
GORDON SETTER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2,355		299	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	2	0.1%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.0%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	9	0.4%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	17	0.7%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	55	2.3%	1	0.3%
25.110	DISTICHIASIS	44	1.9%	4	1.3%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.3%
40.910	KERATOCONJUNCTIVITIS SICCA	3	0.1%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.0%	1	0.3%
CORNEA					
70.210	PANNUS	3	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	8	0.3%	0	0.0%
UVEA					
93.120	IRIS CYST	19	0.8%	1	0.3%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	115	4.9%	52	17.4%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	7	0.3%	1	0.3%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	4	0.2%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	17	0.7%	17	5.7%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.2%	2	0.7%
LENS					
100.200	CATARACT, UNSPECIFIED	9	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	88	3.7%	9	3.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	12	0.5%	4	1.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	12	0.5%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	3	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.2%	1	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	10	0.4%	2	0.7%
100.307	PUNCTATE CATARACT, CAPSULAR	10	0.4%	3	1.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	7	0.3%	1	0.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	15	0.6%	2	0.7%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	9	0.4%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	6	0.3%	1	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	7	0.3%	1	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	2	0.1%	1	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	10	0.4%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***119***	***5.1%***	***15***	***5.0%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	15	0.6%	1	0.3%
110.135	PHPV/ PTVL	7	0.3%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	5	0.2%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	37	1.6%	2	0.7%

OCULAR DISORDERS REPORT
GORDON SETTER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,355 #	 %	Year Examined: 2018-2022 Total # Dogs: 299 #	 %
RETINA Continued				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	4	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	18	0.8%	1	0.3%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.3%
OPTIC NERVE				
130.110 MICROPAPILLA	8	0.3%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	8	0.3%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	40	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED	59	2.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	36	1.5%	10	3.3%
NORMAL				
.000 NORMAL GLOBE	1,913	81.2%	212	70.9%

GRAND BASSET GRIFFON VENDEEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
GRAND BASSET GRIFFON VENDEEN

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 107 #	 %	Year Examined: 2018-2022 Total # Dogs: 93 #	 %
EYELIDS					
25.110	DISTICHIASIS	1	0.9%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	6	5.6%	3	3.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	4.7%	2	2.2%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.9%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	6	5.6%	3	3.2%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	7	6.5%	1	1.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.9%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.9%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	1.1%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	1.1%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.9%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	2	1.9%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.9%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	2	1.9%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	2	1.9%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.9%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.9%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	1	0.9%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***12***	***11.2%***	***2***	***2.2%***
VITREOUS					
110.135	PHPV/ PTVL	1	0.9%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	1	0.9%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.9%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	2	1.9%	0	0.0%
900.100	OTHER, NOT INHERITED	1	0.9%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.9%	1	1.1%
NORMAL					
.000	NORMAL GLOBE	78	72.9%	82	88.2%

GREAT DANE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects associated with partial albinism	Presumed autosomal dominant	2	NO
B.	Glaucoma	Not defined	1, 3	NO
C.	Entropion	Not defined	1	Breeder option
D.	Ectropion	Not defined	1	Breeder option
E.	Distichiasis	Not defined	1	Breeder option
F.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
G.	Prolapsed gland of the third eyelid	Not defined	4	Breeder option
H.	Uveal cysts	Not defined	1, 5	Breeder option
I.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
J.	Cataract	Not defined	1	NO

Description and Comments

A. Microphthalmia with multiple ocular defects associated with partial albinism

Multiple ocular defects are seen associated with partial albinism (white or light coat color) and deafness in Great Danes. The abnormalities are thought to stem from a common developmental defect. Ocular defects are anterior segment dysgenesis, equatorial staphylomas, microphthalmia, cortical cataracts, lens luxation, spherophakia, iris coloboma, and blue irides. An autosomal dominant mode of inheritance is suspected. The hearing loss is attributable to cochlea-saccular degeneration.

B. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Entropion and ectropion often occur together in this breed, associated with an abnormally large palpebral fissure.

D. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

E. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

F. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

G. Prolapsed gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye."

Great Danes were overrepresented in a study of prolapsed gland of the third eyelid. In the study, 83% of the prolapsed glands in Great Danes occurred before 1 year of age. Great Danes were also more likely to develop bilateral prolapsed glands that occurred either simultaneously with the first prolapse or with a short time interval between prolapses.

H. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs. In the Great Dane, pigmented cysts may also arise from pigmented epithelial cells of the ciliary body. Ciliary body cysts may predispose to glaucoma in the Great Dane.

I. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

J. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic

diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gwin RM, Wyman M, Lim DJ, et al. Multiple ocular defects associated with partial albinism and deafness in the dog. *J Am Anim Hosp Assoc*. 1981;17:401-408.

3. Wood JL, Lakhani KH, Mason IK, et al. Relationship of the degree of goniodysgenesis and other ocular measurements to glaucoma in Great Danes. *Am J Vet Res*. 2001;62:1493-1499. PMID: 11560283

4. Mazzucchelli S, Vaillant MD, Weverberg F, et al. Retrospective study of 155 cases of prolapse of the nictitating membrane gland in dogs. *Vet Rec*. 2012;170:443. PMID: 22472538

5. Spiess BM, Bolliger JO, Guscetti F, et al. Multiple ciliary body cysts and secondary glaucoma in the Great Dane: a report of nine cases. *Vet Ophthalmol*. 1998;1:41-45. PMID: 11397208

OCULAR DISORDERS REPORT
GREAT DANE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 7,832 #	 %	2018-2022 2,764 #	 %
GLOBE				
.110 MICROPHTHALMIA	25	0.3%	3	0.1%
10.000 GLAUCOMA	2	0.0%	0	0.0%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	124	1.6%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	213	2.7%	127	4.6%
22.000 ECTROPION, UNSPECIFIED	307	3.9%	114	4.1%
25.110 DISTICHIASIS	426	5.4%	134	4.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	6	0.1%	1	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	2	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	172	2.2%	88	3.2%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	20	0.3%	11	0.4%
CORNEA				
70.210 PANNUS	2	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	5	0.1%	3	0.1%
70.700 CORNEAL DYSTROPHY	30	0.4%	7	0.3%
UVEA				
90.250 PIGMENTARY UVEITIS	1	0.0%	2	0.1%
93.110 IRIS HYPOPLASIA	8	0.1%	7	0.3%
93.120 IRIS CYST	84	1.1%	32	1.2%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	2	0.0%	0	0.0%
93.150 IRIS COLOBOMA	19	0.2%	5	0.2%
93.170 ANTERIOR CHAMBER CYST	18	0.2%	32	1.2%
93.180 IIRIS SPHINCTER DYSPLASIA	1	0.0%	1	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	83	1.1%	23	0.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	16	0.2%	4	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	8	0.1%	4	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	4	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	24	0.3%	29	1.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.0%	2	0.1%
93.810 UVEAL MELANOMA	4	0.1%	2	0.1%
95.120 CILIARY BODY CYST	9	0.1%	1	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.0%	3	0.1%
97.120 COLOBOMA	2	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.1%
120.960 RETINOPATHY	0	0.0%	2	0.1%
130.110 MICROPAPILLA	0	0.0%	1	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	15	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	273	3.5%	89	3.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	48	0.6%	23	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	91	1.2%	30	1.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	23	0.3%	13	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	5	0.1%	2	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	29	0.4%	3	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS	22	0.3%	10	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	47	0.6%	37	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	82	1.0%	29	1.0%

OCULAR DISORDERS REPORT
GREAT DANE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 7,832 #	 %	Year Examined: 2018-2022 Total # Dogs: 2,764 #	 %
LENS Continued				
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	170	2.2%	40	1.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	49	0.6%	19	0.7%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	6	0.1%	1	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	22	0.3%	8	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	34	0.4%	13	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	30	0.4%	15	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	7	0.1%	7	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	11	0.1%	10	0.4%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	2	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	3	0.0%	3	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	3	0.0%	1	0.0%
100.328 Y-SUTURE TIP OPACITIES	6	0.1%	2	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT	53	0.7%	2	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	14	0.2%	1	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***751***	***9.6%***	***269***	***9.7%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	14	0.2%	13	0.5%
110.135 PHPV/ PTVL	16	0.2%	5	0.2%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	17	0.2%	6	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS	29	0.4%	10	0.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	25	0.3%	3	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	3	0.0%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	7	0.1%	1	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	2	0.0%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	2	0.1%
130.120 OPTIC NERVE HYPOPLASIA	4	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	2	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	60	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	144	1.8%	8	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	125	1.6%	123	4.5%
NORMAL				
.000 NORMAL GLOBE	6,094	77.8%	1,968	71.2%

GREAT PYRENEES

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Multifocal retinopathy - *cmr1*	Autosomal recessive	2-4	NO (Breeder option with Normal DNA test for CMR)	Mutation in the *BEST1* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous sub-retinal fluid, or accumulation of sub-retinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007;48:1959-1967. PMID: 17460247

3. Grahn BH, Philibert H, Cullen CL, et al. Multifocal retinopathy of Great Pyrenees dogs. *Vet Ophthalmol*. 1998;1:211-221. PMID: 11397233

4. Grahn BH, Cullen CL. Retinopathy of Great Pyrenees dogs: fluorescein angiography, light microscopy and transmitting and scanning electron microscopy. *Vet Ophthalmol*. 2001;4:191-199. PMID: 11722783

OCULAR DISORDERS REPORT
GREAT PYRENEES

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,294 #	%	2018-2022 145 #	%
GLOBE				
.110 MICROPHTHALMIA	2	0.2%	0	0.0%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	3	0.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	15	1.2%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	3	0.2%	0	0.0%
25.110 DISTICHIASIS	16	1.2%	1	0.7%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.1%	0	0.0%
CORNEA				
70.210 PANNUS	1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY	16	1.2%	1	0.7%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	3	0.2%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	1	0.1%	0	0.0%
93.120 IRIS CYST	7	0.5%	0	0.0%
93.150 IRIS COLOBOMA	1	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.1%	2	1.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	327	25.3%	34	23.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	13	1.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	7	0.5%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.2%	0	0.0%
93.810 UVEAL MELANOMA	1	0.1%	0	0.0%
95.120 CILIARY BODY CYST	0	0.0%	1	0.7%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	2	0.2%	0	0.0%
97.120 COLOBOMA	1	0.1%	0	0.0%
120.960 RETINOPATHY	0	0.0%	1	0.7%
120.970 CMR/ CMR-LIKE RETINOPATHY	0	0.0%	3	2.1%
LENS				
100.200 CATARACT, UNSPECIFIED	3	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	55	4.3%	4	2.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	13	1.0%	1	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	14	1.1%	1	0.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	7	0.5%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	4	0.3%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.1%	1	0.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	26	2.0%	2	1.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	21	1.6%	2	1.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	23	1.8%	3	2.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	6	0.5%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	5	0.4%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.7%
100.330 GENERALIZED/ COMPLETE CATARACT	5	0.4%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
GREAT PYRENEES

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,294 #	 %	2018-2022 145 #	 %
LENS Continued				
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***138***	***10.7%***	***11***	***7.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	1	0.7%
110.135 PHPV/ PTVL	1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	0	0.0%	1	0.7%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	9	0.7%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	16	1.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	0.4%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	4	0.3%	0	0.0%
120.960 RETINOPATHY	8	0.6%	3	2.1%
OPTIC NERVE				
130.110 MICROPAPILLA	6	0.5%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	5	0.4%	0	0.0%
130.150 OPTIC DISC COLOBOMA	2	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	7	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED	35	2.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	18	1.4%	2	1.4%
NORMAL				
.000 NORMAL GLOBE	846	65.4%	93	64.1%

GREATER SWISS MOUNTAIN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
GREATER SWISS MOUNTAIN DOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	3,322		648	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.0%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	21	0.6%	3	0.5%
22.000	ECTROPION, UNSPECIFIED	3	0.1%	0	0.0%
25.110	DISTICHIASIS	1,081	32.5%	141	21.8%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	5	0.2%	0	0.0%
CORNEA					
70.210	PANNUS	2	0.1%	0	0.0%
70.220	PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	13	0.4%	2	0.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA					
93.120	IRIS CYST	5	0.2%	0	0.0%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	113	3.4%	18	2.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	6	0.2%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.2%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	5	0.2%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.0%	1	0.2%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	291	8.8%	30	4.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	83	2.5%	17	2.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	60	1.8%	13	2.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	38	1.1%	6	0.9%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	8	0.2%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	13	0.4%	4	0.6%
100.306	PUNCTATE CATARACT, NUCLEUS	7	0.2%	4	0.6%
100.307	PUNCTATE CATARACT, CAPSULAR	20	0.6%	9	1.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	63	1.9%	15	2.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	94	2.8%	23	3.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	79	2.4%	16	2.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.2%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	13	0.4%	3	0.5%
100.316	INCIPIENT CATARACT, NUCLEUS	9	0.3%	1	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	11	0.3%	2	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.1%	2	0.3%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	8	1.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	2	0.1%	4	0.6%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	4	0.1%	2	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	7	0.2%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***515***	***15.5%***	***128***	***19.8%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	13	0.4%	3	0.5%
110.135	PHPV/ PTVL	4	0.1%	0	0.0%

OCULAR DISORDERS REPORT
GREATER SWISS MOUNTAIN DOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	3,322		648	
	Diagnostic Name	#	%	#	%
VITREOUS Continued					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	2	0.1%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	17	0.5%	2	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	7	0.2%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.1%	2	0.3%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.2%
OPTIC NERVE					
130.110	MICROPAPILLA	7	0.2%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	5	0.2%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	29	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	71	2.1%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	32	1.0%	19	2.9%
NORMAL					
.000	NORMAL GLOBE	1,922	57.9%	397	61.3%

GREENLAND DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the GREENLAND DOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
GREENLAND DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 0 #	%	Year Examined: 2018-2022 Total # Dogs: 2 #	%
UVEA				
90.250 PIGMENTARY UVEITIS	0		1	50.0%
NORMAL				
.000 NORMAL GLOBE	0		1	50.0%

GREYHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Chronic superficial keratitis/pannus	Not defined	2	NO
B.	Cataract	Not defined	1	NO

Description and Comments

A. Chronic superficial keratitis/Pannus

A bilateral disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Peiffer RL, Jr., Gelatt KN, Gwin RM. Chronic superficial keratitis. *Vet Med Small Anim Clin*. 1977;72:35-37. PMID: 584092

OCULAR DISORDERS REPORT
GREYHOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	703		155	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.1%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	2	0.3%	0	0.0%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.1%	0	0.0%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	1	0.1%	1	0.6%
51.100	THIRD EYELID CARTILAGE ANOMALY	2	0.3%	0	0.0%
CORNEA					
70.210	PANNUS	21	3.0%	1	0.6%
70.700	CORNEAL DYSTROPHY	6	0.9%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	0.3%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.3%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	2	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	24	3.4%	14	9.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	7	1.0%	2	1.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	4	0.6%	1	0.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.3%	1	0.6%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.3%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	3	0.4%	3	1.9%
100.307	PUNCTATE CATARACT, CAPSULAR	2	0.3%	5	3.2%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	6	0.9%	1	0.6%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	10	1.4%	1	0.6%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	6	0.9%	2	1.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	2	0.3%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.3%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.3%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***51***	***7.3%***	***16***	***10.3%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.3%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.4%	1	0.6%
110.320	VITREOUS DEGENERATION SYNERESIS	13	1.8%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	3	0.4%	2	1.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	6	0.9%	1	0.6%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.1%	0	0.0%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	1.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.6%
OPTIC NERVE					
130.110	MICROPAPILLA	2	0.3%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	2	0.3%	0	0.0%

OCULAR DISORDERS REPORT
GREYHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 703 #	 %	Year Examined: 2018-2022 Total # Dogs: 155 #	 %
OTHER				
900.000 OTHER, UNSPECIFIED	8	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	14	2.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	31	4.4%	10	6.5%
NORMAL				
.000 NORMAL GLOBE	571	81.2%	124	80.0%

HANOVERIAN HOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the HANOVERIAN HOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
HANOVERIAN HOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		25	
Diagnostic Name		**#**	**%**	**#**	**%**
NORMAL					
.000	NORMAL GLOBE	1	100.0%	25	100.0%

HARRIER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the HARRIER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
HARRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 412 #	 %	Year Examined: 2018-2022 Total # Dogs: 37 #	 %
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	1	0.2%	0	0.0%
25.110 DISTICHIASIS	2	0.5%	0	0.0%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	2.7%
CORNEA				
70.210 PANNUS	1	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY	1	0.2%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	12	2.9%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.2%	0	0.0%
FUNDUS				
97.120 COLOBOMA	1	0.2%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	1.9%	1	2.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.5%	1	2.7%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.2%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	4	1.0%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	3	0.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.2%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.2%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***12***	***2.9%***	***1***	***2.7%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	2.7%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.7%	0	0.0%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	1	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	2	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED	11	2.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	1.2%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	379	92.0%	34	91.9%

HAVANA SILK DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

Any opacity of the lens and/or its capsule, regardless of size or location within the lens. Cataracts are assumed to be hereditary unless associated with known trauma, ocular inflammation, specific metabolic diseases, or nutritional deficiencies

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
HAVANA SILK DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 646 #	 %	Year Examined: 2018-2022 Total # Dogs: 98 #	 %
EYELIDS				
25.110 DISTICHIASIS	32	5.0%	3	3.1%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	2	0.3%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	9	1.4%	1	1.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	33	5.1%	3	3.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.2%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.2%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	12	1.9%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	3	0.5%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.5%	1	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	2	0.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	3	0.5%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	4	0.6%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	4	0.6%	4	4.1%
100.330 GENERALIZED/ COMPLETE CATARACT	2	0.3%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.2%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***20***	***3.1%***	***1***	***1.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	0.3%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.5%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	3	0.5%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	7	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	1	0.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	6	0.9%	1	1.0%
NORMAL				
.000 NORMAL GLOBE	564	87.3%	88	89.8%

HAVANESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1, 3	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1, 2	NO
D.	Y-suture tip opacity	Not defined	1	Breeder option
E.	Vitreous degeneration			
	- syneresis	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

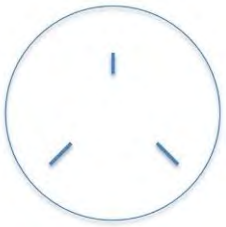
C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The exact frequency and significance of cataracts in the breed is not known.

D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as

diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

E. Vitreous degeneration - syneresis

A liquefaction of the vitreous gel which may predispose to retinal detachment.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Starr AN, Famula TR, Markward NJ, et al. Hereditary evaluation of multiple developmental abnormalities in the Havanese dog breed. *J Hered.* 2007;98:510-517. PMID: 17621585

3. Bellamy KKL, Lingaas F, Madsen P. Heritability of distichiasis in Havanese dogs in Norway. *Canine Med Genet.* 2021; 8(1):11. PMID: 34784963. **reference derived from non-USA dog population**

OCULAR DISORDERS REPORT
HAVANESE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 30,221 #	 %	2018-2022 5,651 #	 %
GLOBE				
.110 MICROPHTHALMIA	6	0.0%	1	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	10	0.0%	3	0.1%
21.000 ENTROPION, UNSPECIFIED	18	0.1%	3	0.1%
22.000 ECTROPION, UNSPECIFIED	4	0.0%	0	0.0%
25.110 DISTICHIASIS	1,508	5.0%	271	4.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.0%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	9	0.0%	4	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA	10	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	2	0.0%	1	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	141	0.5%	30	0.5%
CORNEA				
70.210 PANNUS	2	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	7	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	122	0.4%	32	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	4	0.0%	1	0.0%
UVEA				
90.250 PIGMENTARY UVEITIS	1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA	1	0.0%	1	0.0%
93.120 IRIS CYST	5	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	3	0.0%	0	0.0%
93.150 IRIS COLOBOMA	3	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1,849	6.1%	291	5.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	30	0.1%	3	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	14	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	18	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	38	0.1%	36	0.6%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.0%	2	0.0%
93.810 UVEAL MELANOMA	3	0.0%	1	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	2	0.0%	0	0.0%
97.120 COLOBOMA	4	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	8	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.0%
120.960 RETINOPATHY	0	0.0%	2	0.0%
120.970 CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	22	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,779	5.9%	302	5.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	248	0.8%	91	1.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	151	0.5%	58	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	57	0.2%	11	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	49	0.2%	18	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	451	1.5%	143	2.5%
100.306 PUNCTATE CATARACT, NUCLEUS	28	0.1%	14	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR	109	0.4%	55	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	134	0.4%	31	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	236	0.8%	49	0.9%

OCULAR DISORDERS REPORT
HAVANESE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 30,221 #	 %	2018-2022 5,651 #	 %
LENS Continued				
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	55	0.2%	15	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	18	0.1%	3	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	105	0.3%	17	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	21	0.1%	4	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	55	0.2%	18	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	7	0.0%	4	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	17	0.1%	10	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	5	0.0%	3	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	2	0.0%	1	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.0%	2	0.0%
100.328 Y-SUTURE TIP OPACITIES	241	0.8%	287	5.1%
100.330 GENERALIZED/ COMPLETE CATARACT	125	0.4%	6	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	3	0.0%	2	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	13	0.0%	3	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,900***	***6.3%***	***556***	***9.8%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	30	0.1%	5	0.1%
110.135 PHPV/ PTVL	3	0.0%	2	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	55	0.2%	22	0.4%
110.320 VITREOUS DEGENERATION SYNERESIS	492	1.6%	65	1.2%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	141	0.5%	8	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	25	0.1%	3	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	107	0.4%	5	0.1%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	12	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	2	0.0%
120.960 RETINOPATHY	19	0.1%	6	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	3	0.0%	1	0.0%
130.150 OPTIC DISC COLOBOMA	8	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	257	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	563	1.9%	1	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	295	1.0%	165	2.9%
NORMAL				
.000 NORMAL GLOBE	24,848	82.2%	4,218	74.6%

HOKKAIDO KEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
B.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Autosomal recessive	1, 2	NO	Mutation in the *NHEJ1* gene
C.	Cataract	Not defined	1	NO	

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

C. Cataract

Any opacity of the lens and/or its capsule, regardless of size or location within the lens. Cataracts are assumed to be hereditary unless associated with known trauma, ocular inflammation, specific metabolic diseases, or nutritional deficiencies

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Mizukami K, Chang H, Ota M, et al. Collie eye anomaly in Hokkaido dogs: case study. *Vet Ophthalmol.* 2012;15:128-32. PMID: 22051190 **reference derived from non-USA dog population**

OCULAR DISORDERS REPORT
HOKKAIDO KEN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3 #	 %	2018-2022 35 #	 %
EYELIDS				
25.110 DISTICHIASIS	0	0.0%	2	5.7%
CORNEA				
70.220 PIGMENTARY KERATITIS	0	0.0%	1	2.9%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	9	25.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	0	0.0%	1	2.9%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	2	5.7%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	0	0.0%	10	28.6%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	33.3%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	33.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	2.9%
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	2	5.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	7	20.0%
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	2.9%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	3	8.6%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	2.9%
100.330 GENERALIZED/ COMPLETE CATARACT	0	0.0%	2	5.7%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***33.3%***	***17***	***48.6%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	5.7%
OTHER				
900.100 OTHER, NOT INHERITED	1	33.3%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	1	33.3%	11	31.4%

HOVAWART

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
HOVAWART

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 42 #	 %	Year Examined: 2018-2022 Total # Dogs: 25 #	 %
EYELIDS					
25.110	DISTICHIASIS	2	4.8%	0	0.0%
UVEA					
93.120	IRIS CYST	0	0.0%	2	8.0%
93.170	ANTERIOR CHAMBER CYST	1	2.4%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	4.8%	2	8.0%
95.120	CILIARY BODY CYST	0	0.0%	1	4.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.8%	1	4.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	2	4.8%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	2.4%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	1	4.0%
100.306	PUNCTATE CATARACT, NUCLEUS	1	2.4%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	4.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	4.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	4.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	4.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***4***	***9.5%***	***4***	***16.0%***
VITREOUS					
110.320	VITREOUS DEGENERATION SYNERESIS	1	2.4%	0	0.0%
FUNDUS					
130.110	MICROPAPILLA	0	0.0%	1	4.0%
130.150	OPTIC DISC COLOBOMA	0	0.0%	1	4.0%
OTHER					
900.100	OTHER, NOT INHERITED	0	0.0%	1	4.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	2.4%	1	4.0%
NORMAL					
.000	NORMAL GLOBE	33	78.6%	18	72.0%

IBIZAN HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
B.	Cataract	Not defined	1	NO
C.	Y-suture tip opacities	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

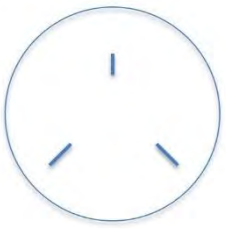
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Y-suture tip opacities

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate

posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
IBIZAN HOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,501		531	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	4	0.3%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	4	0.3%	0	0.0%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.1%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.1%	1	0.2%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	10	0.7%	1	0.2%
UVEA					
93.120	IRIS CYST	3	0.2%	1	0.2%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.1%	0	0.0%
93.150	IRIS COLOBOMA	1	0.1%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	0	0.0%	1	0.2%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	183	12.2%	44	8.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	1	0.2%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	14	0.9%	10	1.9%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.3%	0	0.0%
95.120	CILIARY BODY CYST	1	0.1%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.1%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	1	0.1%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	4	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	85	5.7%	31	5.8%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	9	0.6%	9	1.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	4	0.3%	2	0.4%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.2%	1	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.2%	5	0.9%
100.306	PUNCTATE CATARACT, NUCLEUS	13	0.9%	10	1.9%
100.307	PUNCTATE CATARACT, CAPSULAR	6	0.4%	4	0.8%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	6	0.4%	3	0.6%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	9	0.6%	4	0.8%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	5	0.3%	3	0.6%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	1	0.2%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	27	1.8%	11	2.1%
100.317	INCIPIENT CATARACT, CAPSULAR	3	0.2%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.2%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	2	0.1%	7	1.3%
100.330	GENERALIZED/ COMPLETE CATARACT	2	0.1%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.2%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***98***	***6.5%***	***55***	***10.4%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	3	0.2%	3	0.6%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	6	0.4%	1	0.2%
110.320	VITREOUS DEGENERATION SYNERESIS	11	0.7%	1	0.2%

OCULAR DISORDERS REPORT
IBIZAN HOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,501 #	 %	Year Examined: 2018-2022 Total # Dogs: 531 #	 %
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	11	0.7%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	4	0.3%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
120.960 RETINOPATHY	1	0.1%	0	0.0%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	3	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	24	1.6%	0	0.0%
900.100 OTHER, NOT INHERITED	20	1.3%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	21	1.4%	15	2.8%
NORMAL				
.000 NORMAL GLOBE	1,189	79.2%	415	78.2%

ICELANDIC SHEEPDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
ICELANDIC SHEEPDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,270 #	 %	2018-2022 887 #	 %
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	5	0.2%	0	0.0%
25.110 DISTICHIASIS	21	0.9%	4	0.5%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	0	0.0%	1	0.1%
CORNEA				
70.210 PANNUS	0	0.0%	2	0.2%
70.220 PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	9	0.4%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	2	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	0	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	113	5.0%	29	3.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.1%	2	0.2%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	56	2.5%	40	4.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	14	0.6%	8	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	8	0.4%	2	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.1%	2	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	15	0.7%	4	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS	3	0.1%	5	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR	7	0.3%	16	1.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.1%	1	0.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	14	0.6%	1	0.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	4	0.2%	3	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	9	0.4%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	5	0.6%
100.317 INCIPIENT CATARACT, CAPSULAR	3	0.1%	4	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.1%	3	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.2%	1	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	6	0.3%	5	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.0%	2	0.2%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***91***	***4.0%***	***61***	***6.9%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	3	0.1%	1	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	4	0.2%	1	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	9	0.4%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.0%	0	0.0%
120.960 RETINOPATHY	0	0.0%	3	0.3%
FUNDUS				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	3	0.3%
120.960 RETINOPATHY	0	0.0%	1	0.1%

OCULAR DISORDERS REPORT
ICELANDIC SHEEPDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,270 #	 %	Year Examined: 2018-2022 Total # Dogs: 887 #	 %
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	2	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	25	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	31	1.4%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	43	1.9%	46	5.2%
NORMAL				
.000 NORMAL GLOBE	2,056	90.6%	755	85.1%

IRISH RED AND WHITE SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- rod-cone dysplasia, type 1 (*rcd1*)	Autosomal recessive	2-21	NO	Mutation of the *PDE6B* gene
	- rod-cone dysplasia, type 4 (*rcd4*)	Autosomal recessive	22	NO	mutation of the *C2orf71* gene
B.	Cataract	Not defined	1	NO	

Description and Comments

A. Retinal atrophy

- rod-cone dysplasia, type 1 (*rcd1*)

A form of PRA identified in Irish Setters and Irish Red and White Setters. Clinical night blindness is observed as early as 6 weeks of age progressing to total blindness by one year. It may be diagnosed as early as 24 days with an ERG. Histologically the disease can be detected by 6 weeks. The disorder is caused by a mutation present in exon 21/codon 807 of the *PDE6B* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

- rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Hodgman SSea. Progressive retinal atrophy in dogs. The disease of Irish Setters (rcd). *Vet Rec*. 1949;61:185-189.

3. Parry HB. Degenerations of the dog retina. II. Generalized progressive atrophy of hereditary origin. *Br J Ophthalmol*. 1953;37:487-502. PMID: 13081944

4. Aguirre GD, Rubin LF. Rod-cone dysplasia (progressive retinal atrophy) in Irish Setters. *J Am Vet Med Assoc*. 1975;166:157-164. PMID: 1112740

5. Aguirre G, Farber D, Lolley R, et al. Rod-Cone Dysplasia in Irish Setters - Defect in Cyclic-Gmp Metabolism in Visual Cells. *Science*. 1978;201:1133-1134.

6. Lewis DG. [Reappearance of PRA in the Irish Setter]. *Vet Rec*. 1977;101:122-123. PMID: 906234

7. Liu YP, Krishna G, Aguirre G, et al. Involvement of cyclic GMP phosphodiesterase activator in an hereditary retinal degeneration. *Nature*. 1979;280:62-64.

8. Aguirre G, Farber D, Lolley R, et al. Retinal degeneration in the dog. III. Abnormal cyclic nucleotide metabolism in rod-cone dysplasia. *Exp Eye Res*. 1982;35:625-642. PMID: 6295790

9. Lee RH, Lieberman BS, Hurwitz RL. Phosphodiesterase probes show distinct defects in rd mice and Irish Setter dog disorders. *Invest Ophthalmol Vis Sci*. 1985;26:1569-1579. PMID: 2997075

10. Lolley R, Lee R, Hurwitz R. Biochemical and immunological characteristics of photoreceptor phosphodiesterase in inherited retinal degeneration of rd mice and affected Irish Setter dogs. In: *Retinal Degeneration: Experimental and Clinical Studies* (ed. LaVail MM, Hollyfield JG, Anderson RE). Alan R. Liss, Inc.; New York, 1985. p. 133-146. (Book)

11. Schmidt SY, Aguirre GD. Reductions in taurine secondary to photoreceptor loss in Irish Setters with rod-cone dysplasia. *Invest Ophthalmol Vis Sci*. 1985;26:679-683. PMID: 3997418

12. Fletcher RT, Sanyal S, Krishna G, et al. Genetic expression of cyclic GMP phosphodiesterase activity defines abnormal photoreceptor differentiation in neurological mutants of inherited retinal degeneration. *J Neurochem*. 1986;46:1240-1245. PMID: 3005510

13. Schmidt SY, Andley UP, Heth CA, et al. Deficiency in light-dependent opsin phosphorylation in Irish Setters with rod-cone dysplasia. *Invest Ophthalmol Vis Sci*. 1986;27:1551-1559. PMID: 3021647

14. Barbehenn E, Gagnon C, Noelker D, et al. Inherited rod-cone dysplasia: abnormal distribution of cyclic GMP in visual cells of affected Irish Setters. *Exp Eye Res*. 1988;46:149-159. PMID: 2895011

15. Cunnick J, Rider M, Takemoto LJ, et al. Rod/cone dysplasia in Irish Setters. Presence of an altered rhodopsin. *Biochem J*. 1988;250:335-341. PMID: 3355528

16. Farber DB, Danciger JS, Aguirre G. The beta subunit of cyclic GMP phosphodiesterase mRNA is deficient in canine rod-cone dysplasia 1. *Neuron*. 1992;9:349-356. PMID: 1323314

17. Clements PJ, Gregory CY, Peterson-Jones SM, et al. Confirmation of the rod cGMP phosphodiesterase beta subunit (PDE beta) nonsense mutation in affected rcd-1 Irish Setters in the UK and development of a diagnostic test. *Curr Eye Res*. 1993;12:861-866. PMID: 8261797

18. Suber ML, Pittler SJ, Qin N, et al. Irish Setter dogs affected with rod/cone dysplasia contain a nonsense mutation in the rod cGMP phosphodiesterase beta-subunit gene. *Proc Natl Acad Sci U S A*. 1993;90:3968-3972. PMID: 8387203

19. Ray K, Baldwin VJ, Acland GM, et al. Cosegregation of codon 807 mutation of the canine rod cGMP phosphodiesterase beta gene and rcd1. *Invest Ophthalmol Vis Sci*. 1994;35:4291-4299. PMID:

8002249

20. Ray K, Baldwin VJ, Acland GM, et al. Molecular diagnostic tests for ascertainment of genotype at the rod cone dysplasia 1 (rcd1) locus in Irish Setters. *Curr Eye Res*. 1995;14:243-247.

21. Petersen-Jones SM, Clements PJ, Barnett KC, et al. Incidence of the gene mutation causal for rod-cone dysplasia type 1 in Irish Setters in the UK. *J Small Anim Pract*. 1995;36:310-314. PMID: 7474961

22. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. *Anim Genet*. 2012 Jun 12. PMID: 22686255

OCULAR DISORDERS REPORT
IRISH RED & WHITE SETTER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 556 #	%	2018-2022 197 #	%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	1	0.2%	0	0.0%
25.110 DISTICHIASIS	23	4.1%	2	1.0%
CORNEA				
70.210 PANNUS	2	0.4%	0	0.0%
70.700 CORNEAL DYSTROPHY	1	0.2%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.2%	0	0.0%
UVEA				
93.120 IRIS CYST	2	0.4%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	8	1.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.2%	3	1.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.2%	0	0.0%
95.120 CILIARY BODY CYST	1	0.2%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	22	4.0%	14	7.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	6	1.1%	5	2.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	7	1.3%	3	1.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.2%	1	0.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.4%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	3	1.5%
100.307 PUNCTATE CATARACT, CAPSULAR	3	0.5%	5	2.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	6	1.1%	1	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	8	1.4%	1	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.4%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	3	0.5%	1	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.2%	2	1.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.2%	1	0.5%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.2%	1	0.5%
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	2	1.0%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.2%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***43***	***7.7%***	***24***	***12.2%***
VITREOUS				
110.135 PHPV/ PTVL	1	0.2%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	4	0.7%	2	1.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	4	0.7%	1	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.4%	1	0.5%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.5%	0	0.0%
120.960 RETINOPATHY	1	0.2%	0	0.0%
FUNDUS				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.5%
OTHER				
900.000 OTHER, UNSPECIFIED	5	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	7	1.3%	1	0.5%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	18	3.2%	21	10.7%
NORMAL				
.000 NORMAL GLOBE	468	84.2%	152	77.2%

IRISH SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- generalized	Not defined	22	NO	
	- rod-cone dysplasia, type 1 (*rcd1*)	Autosomal recessive	1, 2-21	NO	Mutation of the *PDE6B* gene
	- rod-cone dysplasia type 4 (*rcd4*)	Autosomal recessive	23	NO	Mutation of the *C2orf71* gene
F.	Amblyopia with quadriplegia	Autosomal recessive	24, 25	NO	

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the Irish Setter, the entropion usually involves the lower eyelids.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision

impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

In the Irish Setter, a later form of progressive retinal atrophy has been observed by several ophthalmologists at 4-5 years of age. Cases seen in this category appear to advance more rapidly than those with rod-cone dysplasia.

- rod-cone dysplasia, type 1 (*rcd1*)

A form of PRA identified in Irish Setters. Clinical night blindness is observed as early as 6 weeks of age progressing to total blindness by one year. It may be diagnosed as early as 24 days with an ERG. Histologically the disease can be detected by 6 weeks. The disorder is caused by a mutation present in exon 21/codon 807 of the *PDE6B* gene. A DNA test is available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

- rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

F. Amblyopia with quadriplegia

A congenital quadriplegia and amblyopia. The main symptoms include inability to stand or walk, amblyopia, tremor, nystagmus and possible seizures. Pathologic lesions are confined to the cerebellum. The condition was shown to be due to a fully penetrant autosomal recessive gene that is post-natally lethal in the homozygote.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Hodgman SSea. Progressive retinal atrophy in dogs. The disease of Irish Setters (rcd). *Vet Rec*.

1949;61:185-189.

3. Parry HB. Degenerations of the dog retina. II. Generalized progressive atrophy of hereditary origin. *Br J Ophthalmol*. 1953;37:487-502. PMID: 13081944

4. Aguirre GD, Rubin LF. Rod-cone dysplasia (progressive retinal atrophy) in Irish Setters. *J Am Vet Med Assoc*. 1975;166:157-164. PMID: 1112740

5. Aguirre G, Farber D, Lolley R, et al. Rod-Cone Dysplasia in Irish Setters - Defect in Cyclic-Gmp Metabolism in Visual Cells. *Science*. 1978;201:1133-1134.

6. Lewis DG. [Reappearance of PRA in the Irish Setter]. *Vet Rec*. 1977;101:122-123. PMID: 906234

7. Liu YP, Krishna G, Aguirre G, et al. Involvement of cyclic GMP phosphodiesterase activator in an hereditary retinal degeneration. *Nature*. 1979;280:62-64.

8. Aguirre G, Farber D, Lolley R, et al. Retinal degeneration in the dog. III. Abnormal cyclic nucleotide metabolism in rod-cone dysplasia. *Exp Eye Res*. 1982;35:625-642. PMID: 6295790

9. Lee RH, Lieberman BS, Hurwitz RL. Phosphodiesterase probes show distinct defects in rd mice and Irish Setter dog disorders. *Invest Ophthalmol Vis Sci*. 1985;26:1569-1579. PMID: 2997075

10. Lolley R, Lee R, Hurwitz R. Biochemical and immunological characteristics of photoreceptor phosphodiesterase in inherited retinal degeneration of rd mice and affected Irish Setter dogs. In: *Retinal Degeneration: Experimental and Clinical Studies* (ed. LaVail MM, Hollyfield JG, Anderson RE). Alan R. Liss, Inc.; New York, 1985. p. 133-146. (Book)

11. Schmidt SY, Aguirre GD. Reductions in taurine secondary to photoreceptor loss in Irish Setters with rod-cone dysplasia. *Invest Ophthalmol Vis Sci*. 1985;26:679-683. PMID: 3997418

12. Fletcher RT, Sanyal S, Krishna G, et al. Genetic expression of cyclic GMP phosphodiesterase activity defines abnormal photoreceptor differentiation in neurological mutants of inherited retinal degeneration. *J Neurochem*. 1986;46:1240-1245. PMID: 3005510

13. Schmidt SY, Andley UP, Heth CA, et al. Deficiency in light-dependent opsin phosphorylation in Irish Setters with rod-cone dysplasia. *Invest Ophthalmol Vis Sci*. 1986;27:1551-1559. PMID: 3021647

14. Barbehenn E, Gagnon C, Noelker D, et al. Inherited rod-cone dysplasia: abnormal distribution of cyclic GMP in visual cells of affected Irish Setters. *Exp Eye Res*. 1988;46:149-159. PMID: 2895011

15. Cunnick J, Rider M, Takemoto LJ, et al. Rod/cone dysplasia in Irish Setters. Presence of an altered rhodopsin. *Biochem J*. 1988;250:335-341. PMID: 3355528

16. Farber DB, Danciger JS, Aguirre G. The beta subunit of cyclic GMP phosphodiesterase mRNA is deficient in canine rod-cone dysplasia 1. *Neuron*. 1992;9:349-356. PMID: 1323314

17. Clements PJ, Gregory CY, Peterson-Jones SM, et al. Confirmation of the rod cGMP phosphodiesterase beta subunit (PDE beta) nonsense mutation in affected rcd-1 Irish Setters in the UK and development of a diagnostic test. *Curr Eye Res*. 1993;12:861-866. PMID: 8261797

18. Suber ML, Pittler SJ, Qin N, et al. Irish Setter dogs affected with rod/cone dysplasia contain a nonsense mutation in the rod cGMP phosphodiesterase beta-subunit gene. *Proc Natl Acad Sci U S A*. 1993;90:3968-3972. PMID: 8387203

19. Ray K, Baldwin VJ, Acland GM, et al. Cosegregation of codon 807 mutation of the canine rod cGMP

phosphodiesterase beta gene and rcd1. *Invest Ophthalmol Vis Sci*. 1994;35:4291-4299. PMID: 8002249

20. Ray K, Baldwin VJ, Acland GM, et al. Molecular diagnostic tests for ascertainment of genotype at the rod cone dysplasia 1 (rcd1) locus in Irish Setters. *Curr Eye Res*. 1995;14:243-247.

21. Petersen-Jones SM, Clements PJ, Barnett KC, et al. Incidence of the gene mutation causal for rod-cone dysplasia type 1 in Irish Setters in the UK. *J Small Anim Pract*. 1995;36:310-314. PMID: 7474961

22. Djajadiningrat-Laanen SC, Boeve MH, Stades FC, et al. Familial non-rcd1 generalised retinal degeneration in Irish Setters. *J Small Anim Pract*. 2003;44:113-116. PMID: 12653325

23. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. *Anim Genet*. 2012;44:169-177. PMID: 22686255

24. Sakai T, Harashima T, Yamamura H, et al. 2 Cases of Hereditary Quadriplegia and Amblyopia in a Litter of Irish Setters. *J Small Anim Pract*. 1994;35:221-223.

25. Palmer AC, Payne JE, Wallace ME. Hereditary quadriplegia and amblyopia in the Irish Setter. *J Small Anim Pract*. 1973;14:343-352. PMID: 4803922

OCULAR DISORDERS REPORT
IRISH SETTER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,177 #	%	2018-2022 303 #	%
GLOBE				
.110 MICROPHTHALMIA	2	0.1%	0	0.0%
10.000 GLAUCOMA	1	0.0%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	2	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	54	2.5%	3	1.0%
22.000 ECTROPION, UNSPECIFIED	9	0.4%	0	0.0%
25.110 DISTICHIASIS	124	5.7%	14	4.6%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.1%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	3	0.1%	0	0.0%
CORNEA				
70.210 PANNUS	1	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	6	0.3%	1	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA				
93.120 IRIS CYST	2	0.1%	2	0.7%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	2	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	1	0.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	92	4.2%	18	5.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	7	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	30	1.4%	11	3.6%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.2%	0	0.0%
93.810 UVEAL MELANOMA	1	0.0%	0	0.0%
95.120 CILIARY BODY CYST	0	0.0%	1	0.3%
LENS				
100.200 CATARACT, UNSPECIFIED	31	1.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	108	5.0%	13	4.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	14	0.6%	7	2.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	18	0.8%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.1%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	4	0.2%	2	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR	16	0.7%	3	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	22	1.0%	4	1.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	21	1.0%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	5	0.2%	1	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	4	0.2%	1	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	4	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	8	0.4%	1	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR	7	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	1	0.3%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	1	0.3%
100.328 Y-SUTURE TIP OPACITIES	1	0.0%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	18	0.8%	0	0.0%

OCULAR DISORDERS REPORT
IRISH SETTER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,177 #	 %	Year Examined: 2018-2022 Total # Dogs: 303 #	 %
LENS Continued				
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***184***	***8.5%***	***21***	***6.9%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	24	1.1%	9	3.0%
110.135 PHPV/ PTVL	10	0.5%	2	0.7%
110.320 VITREOUS DEGENERATION SYNERESIS	4	0.2%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	4	1.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.3%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.7%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	11	0.5%	1	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	18	0.8%	0	0.0%
120.960 RETINOPATHY	0	0.0%	1	0.3%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	4	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	19	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	38	1.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	45	2.1%	17	5.6%
NORMAL				
.000 NORMAL GLOBE	1,655	76.0%	218	71.9%

IRISH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
IRISH TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	95		39	
	Diagnostic Name	#	%	#	%
EYELIDS					
25.110	DISTICHIASIS	1	1.1%	1	2.6%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	0	0.0%	1	2.6%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	1.1%	1	2.6%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	1.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	2.6%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	9	9.5%	6	15.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	1	2.6%
100.306	PUNCTATE CATARACT, NUCLEUS	3	3.2%	4	10.3%
100.307	PUNCTATE CATARACT, CAPSULAR	1	1.1%	1	2.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	2	2.1%	2	5.1%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1	1.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	1.1%	2	5.1%
100.317	INCIPIENT CATARACT, CAPSULAR	3	3.2%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	1	1.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***12***	***12.6%***	***10***	***25.6%***
OTHER					
900.000	OTHER, UNSPECIFIED	3	3.2%	0	0.0%
900.100	OTHER, NOT INHERITED	1	1.1%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	2	5.1%
NORMAL					
.000	NORMAL GLOBE	79	83.2%	26	66.7%

IRISH WATER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO
D.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Corneal dystrophy – epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report

OCULAR DISORDERS REPORT
IRISH WATER SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,182 #	%	2018-2022 195 #	%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	10	0.8%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	3	0.3%	0	0.0%
25.110 DISTICHIASIS	302	25.5%	48	24.6%
CORNEA				
70.700 CORNEAL DYSTROPHY	4	0.3%	5	2.6%
UVEA				
93.120 IRIS CYST	2	0.2%	1	0.5%
93.150 IRIS COLOBOMA	1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	53	4.5%	15	7.7%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	0.3%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	3	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	109	9.2%	19	9.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	31	2.6%	11	5.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	12	1.0%	6	3.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	8	0.7%	1	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.2%	1	0.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.3%	1	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS	4	0.3%	1	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR	4	0.3%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	15	1.3%	1	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	23	1.9%	4	2.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	10	0.8%	1	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.2%	1	0.5%
100.316 INCIPIENT CATARACT, NUCLEUS	6	0.5%	1	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	5	0.4%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.5%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.1%	1	0.5%
100.328 Y-SUTURE TIP OPACITIES	1	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***133***	***11.3%***	***31***	***15.9%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	0.2%	3	1.5%
110.320 VITREOUS DEGENERATION SYNERESIS	2	0.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	5	0.4%	1	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	0.4%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	2	1.0%
120.960 RETINOPATHY	2	0.2%	1	0.5%
OTHER				
900.000 OTHER, UNSPECIFIED	20	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED	15	1.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	15	1.3%	7	3.6%

OCULAR DISORDERS REPORT
IRISH WATER SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,182 #	%	2018-2022 195 #	%
NORMAL				
.000 NORMAL GLOBE	794	67.2%	109	55.9%

IRISH WOLFHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
C.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
E.	Uveal cysts	Not defined	1	Breeder option
F.	Cataract	Not defined	1	NO
G.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
H.	Optic nerve hypoplasia	Not defined	1	NO
I.	Micropapilla	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally in the neonatal period. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

H. Optic nerve hypoplasia

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

I. Micropapilla

A congenital anomaly which results in a small optic disk diameter without vision loss. Contrast with optic nerve hypoplasia, which may have a similar ophthalmoscopic appearance with vision loss.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
IRISH WOLFHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,065 #	%	2018-2022 506 #	%
GLOBE				
.110 MICROPHTHALMIA	1	0.0%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	6	0.3%	0	0.0%
25.110 DISTICHIASIS	101	4.9%	30	5.9%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.2%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	1	0.0%	0	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY	20	1.0%	9	1.8%
CORNEA				
70.220 PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	38	1.8%	3	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	94	4.6%	21	4.2%
93.170 ANTERIOR CHAMBER CYST	16	0.8%	29	5.7%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	21	1.0%	9	1.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	7	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	11	0.5%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	5	0.2%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.1%	0	0.0%
93.810 UVEAL MELANOMA	1	0.0%	0	0.0%
95.120 CILIARY BODY CYST	5	0.2%	1	0.2%
LENS				
100.200 CATARACT, UNSPECIFIED	12	0.6%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	94	4.6%	37	7.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	16	0.8%	1	0.2%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	28	1.4%	5	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	5	0.2%	3	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	11	0.5%	2	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS	9	0.4%	10	2.0%
100.307 PUNCTATE CATARACT, CAPSULAR	13	0.6%	6	1.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	15	0.7%	8	1.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	39	1.9%	12	2.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	9	0.4%	6	1.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	15	0.7%	1	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS	10	0.5%	7	1.4%
100.317 INCIPIENT CATARACT, CAPSULAR	6	0.3%	10	2.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES	2	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	5	0.2%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***202***	***9.8%***	***72***	***14.2%***

OCULAR DISORDERS REPORT
IRISH WOLFHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,065 #	 %	Year Examined: 2018-2022 Total # Dogs: 506 #	 %
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	6	0.3%	1	0.2%
110.135 PHPV/ PTVL	0	0.0%	1	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS	7	0.3%	2	0.4%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.2%
130.110 MICROPAPILLA	0	0.0%	1	0.2%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	2	0.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	28	1.4%	5	1.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	11	0.5%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2	0.1%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	1	0.0%	1	0.2%
120.970 CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.2%
OPTIC NERVE				
130.110 MICROPAPILLA	12	0.6%	7	1.4%
130.120 OPTIC NERVE HYPOPLASIA	29	1.4%	1	0.2%
130.150 OPTIC DISC COLOBOMA	2	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	22	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	59	2.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	51	2.5%	24	4.7%
NORMAL				
.000 NORMAL GLOBE	1,566	75.8%	340	67.2%

ITALIAN GREYHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Imperforate lower nasolacrimal punctum	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Vitreous degeneration			
	- syneresis	Not defined	1, 2	Breeder option
	- anterior chamber	Not defined	1, 2	Breeder option
D.	Retinal atrophy			
	- generalized	Not defined	1	NO
	- *IG-PRA1***	Autosomal recessive	3	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Italian Greyhound, posterior subcapsular and cortical cataracts at two to three years of age appear to be the more common location of occurrence, with progression noted in an undetermined percentage of dogs.

B. Vitreous degeneration - syneresis

A liquefaction of the vitreous gel which may predispose to retinal detachment, but in this breed, it was shown not to be associated (Krishnan et al reference)

C. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- IG-PRA1

Italian Greyhound PRA (*IG-PRA1*) is considered a "late onset" PRA with clinical signs detected between 3-5 years of age. Dogs initially lose night vision followed by decreased vision in bright light conditions. Clinically increases in tapetal reflectivity and retinal vessel attenuation are noted. The risk allele is known, but the genetic mutation has not been determined. The disease has been presumed to be inherited as an autosomal recessive trait. However some affected dogs had only one copy of the risk allele suggesting an autosomal dominant with incomplete penetrance mode of inheritance.

At least one other form of PRA appears to be present in the breed and will not be detected with this test.

**A DNA test is available for the risk allele, but is multilocus and no mutation is described.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Krishnan, H., et al. (2020). "Vitreous degeneration and associated ocular abnormalities in the dog." Vet Ophthalmol 23(2): 219-224. PMID: 31464365

3. Goldstein O, Pearce-Kelling, SE, Aguirre GD, Acland GM. Adult onset autosomal recessive hereditary retinal degeneration in Italian Greyhound dogs. *IOVS*, April 2011, Vol 52, 4351. ARVO abstract. (Only reference available for this condition)

OCULAR DISORDERS REPORT
ITALIAN GREYHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 7,898 #	 %	2018-2022 536 #	 %
GLOBE				
.110 MICROPHTHALMIA	1	0.0%	1	0.2%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	0	0.0%	1	0.2%
25.110 DISTICHIASIS	22	0.3%	1	0.2%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	8	0.1%	1	0.2%
CORNEA				
70.210 PANNUS	7	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS	2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	19	0.2%	2	0.4%
UVEA				
93.110 IRIS HYPOPLASIA	1	0.0%	0	0.0%
93.120 IRIS CYST	3	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	3	0.0%	0	0.0%
93.150 IRIS COLOBOMA	6	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	52	0.7%	3	0.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	6	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	5	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	7	0.1%	2	0.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.1%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	22	0.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	5	0.9%
LENS				
100.200 CATARACT, UNSPECIFIED	17	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	351	4.4%	21	3.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	119	1.5%	18	3.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	97	1.2%	2	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	35	0.4%	4	0.7%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	6	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	20	0.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	9	0.1%	2	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	19	0.2%	3	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	182	2.3%	9	1.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	185	2.3%	6	1.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	107	1.4%	5	0.9%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	9	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	18	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	16	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	18	0.2%	2	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	12	0.2%	2	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	11	0.1%	6	1.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	4	0.7%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES	2	0.0%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	49	0.6%	2	0.4%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	36	0.5%	0	0.0%

OCULAR DISORDERS REPORT
ITALIAN GREYHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 7,898 #	 %	2018-2022 536 #	 %
LENS Continued				
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***933***	***11.8%***	***67***	***12.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	22	0.3%	3	0.6%
110.135 PHPV/ PTVL	3	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1,069	13.5%	97	18.1%
110.320 VITREOUS DEGENERATION SYNERESIS	1,718	21.8%	64	11.9%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	26	0.3%	1	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	4	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	1	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	250	3.2%	2	0.4%
120.400 RETINAL HEMORRHAGE	19	0.2%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	8	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	2	0.4%
120.960 RETINOPATHY	7	0.1%	2	0.4%
OPTIC NERVE				
130.110 MICROPAPILLA	20	0.3%	3	0.6%
130.120 OPTIC NERVE HYPOPLASIA	35	0.4%	2	0.4%
130.150 OPTIC DISC COLOBOMA	4	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	63	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	138	1.7%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	108	1.4%	21	3.9%
NORMAL				
.000 NORMAL GLOBE	5,151	65.2%	354	66.0%

JACK RUSSELL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Lens luxation	Autosomal recessive	1, 2-7	NO	Mutation of the *ADAMTS17* gene
E.	Vitreous degeneration				
	- syneresis	Not defined	1, 2	Breeder option	
F.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1, 8	NO	Mutation of the *prcd* gene
G.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	8	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except

in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from its normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinal Atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that one form of PRA in the Jack Russell Terrier is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

G. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Lawson DD. Luxation of the crystalline lens in the dog. J Small Anim Pract. 1969;10:461-463. PMID: 5387868

3. Curtis R, Barnett KC. Primary lens luxation in the dog. J Small Anim Pract. 1980;21:657-668. PMID: 6969820

4. Curtis R, Barnett KC, Lewis SJ. Clinical and pathological observations concerning the aetiology of primary lens luxation in the dog. Vet Rec. 1983;112:238-246. PMID: 6601878

5. Oberbauer AM, Hollingsworth SR, Belanger JM, et al. Inheritance of cataracts and primary lens luxation in Jack Russell Terriers. Am J Vet Res. 2008;69:222-227. PMID: 18241019

6. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. Invest Ophthalmol Vis Sci. 2010;51:4716-4721. PMID: 20375329

7. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. Vet Ophthalmol. 2011;14:378-384. PMID: 22050825

8. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
JACK RUSSELL TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	16,049		1,438	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	5	0.0%	0	0.0%
10.000	GLAUCOMA	3	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	2	0.0%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	3	0.0%	0	0.0%
25.110	DISTICHIASIS	365	2.3%	23	1.6%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	2	0.0%	1	0.1%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	0	0.0%	1	0.1%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	1	0.1%
CORNEA					
70.210	PANNUS	1	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	9	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	63	0.4%	6	0.4%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	10	0.1%	1	0.1%
UVEA					
93.120	IRIS CYST	5	0.0%	0	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150	IRIS COLOBOMA	4	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	731	4.6%	58	4.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	40	0.2%	1	0.1%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	18	0.1%	1	0.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	10	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	12	0.1%	13	0.9%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	6	0.0%	0	0.0%
95.120	CILIARY BODY CYST	1	0.0%	0	0.0%
FUNDUS					
97.120	COLOBOMA	2	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	3	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.1%
LENS					
100.200	CATARACT, UNSPECIFIED	4	0.0%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	551	3.4%	56	3.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	96	0.6%	24	1.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	87	0.5%	15	1.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	24	0.1%	7	0.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	16	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	62	0.4%	12	0.8%
100.306	PUNCTATE CATARACT, NUCLEUS	30	0.2%	11	0.8%
100.307	PUNCTATE CATARACT, CAPSULAR	23	0.1%	7	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	193	1.2%	15	1.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	384	2.4%	33	2.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	67	0.4%	10	0.7%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	8	0.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	143	0.9%	10	0.7%
100.316	INCIPIENT CATARACT, NUCLEUS	32	0.2%	1	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	27	0.2%	4	0.3%

OCULAR DISORDERS REPORT
JACK RUSSELL TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 16,049 #	 %	2018-2022 1,438 #	 %
LENS Continued				
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	3	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	6	0.0%	10	0.7%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	9	0.1%	8	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT	95	0.6%	3	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	82	0.5%	1	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,301***	***8.1%***	***166***	***11.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	19	0.1%	2	0.1%
110.135 PHPV/ PTVL	4	0.0%	1	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	25	0.2%	4	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS	213	1.3%	13	0.9%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	58	0.4%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	20	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	4	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	85	0.5%	0	0.0%
120.400 RETINAL HEMORRHAGE	4	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	8	0.0%	0	0.0%
120.960 RETINOPATHY	2	0.0%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	7	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	12	0.1%	1	0.1%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	113	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	645	4.0%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	145	0.9%	64	4.5%
NORMAL				
.000 NORMAL GLOBE	13,264	82.6%	1,148	79.8%

JAGDTERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1	NO	Mutation of the *ADAMTS17* gene

Description and Comments

A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Jagdterrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. Vet Ophthalmol. 2011; 14: 378-384. PMID: 22050825

OCULAR DISORDERS REPORT
JAGDTERRIER

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	2		1	
Diagnostic Name	**#**	**%**	**#**	**%**
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	100.0%
NORMAL				
.000 NORMAL GLOBE	2	100.0%	0	0.0%

JAMTHUND

(Swedish Elkhound)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Retinal atrophy - generalized	Not defined	1	NO

Description and Comments

A. Retinal atrophy, generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Jamthund.

1. Hertil E, Bergström T, Kell U, Karlstam L, Ekman S, Ekesten B. Retinal degeneration in nine Swedish Jämthund dogs. Vet Ophthalmol. 2010 Mar;13(2):110-6. doi: 10.1111/j.1463-5224.2010.00761.x. PMID: 20447030.

OCULAR DISORDERS REPORT
JAMTHUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 0 #	%	Year Examined: 2018-2022 Total # Dogs: 1 #	%
NORMAL				
.000 NORMAL GLOBE	0		1	100.0%

JAPANESE AKITA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Corneal dystrophy			
	– epithelial/stromal	Not defined	1	Breeder option
D	Cataract	Not defined	1	NO
E	Y suture tip opacities	Not defined	1	Breeder option
F.	Persistent hyaloid artery remnant	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

Commented [1]: add blurbs for distichia and Y suture tip o

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
JAPANESE AKITA

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 104 #	%	2018-2022 223 #	%
EYELIDS				
25.110 DISTICHIASIS	1	1.0%	5	2.2%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	1.0%	6	2.7%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	7	6.7%	25	11.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	1.0%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	6	5.8%	16	7.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	1.0%	1	0.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	1.9%	3	1.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	0	0.0%	2	0.9%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	4	3.8%	4	1.8%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	3	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR	1	1.0%	4	1.8%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR	0	0.0%	6	2.7%
100.326 INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES	3	2.9%	9	4.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***8***	***7.7%***	***26***	***11.7%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	8	3.6%
110.320 VITREOUS DEGENERATION SYNERESIS	1	1.0%	1	0.4%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	4	1.8%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	1.0%	1	0.4%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	1.0%	0	0.0%
120.960 RETINOPATHY	0	0.0%	2	0.9%
OTHER				
900.100 OTHER, NOT INHERITED	3	2.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	7.7%	17	7.6%
NORMAL				
.000 NORMAL GLOBE	77	74.0%	151	67.7%

JAPANESE CHIN

(JAPANESE SPANIEL)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Exposure keratopathy syndrome	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	2	NO	Mutation of the *prcd* gene

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or more of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Exposure keratopathy syndrome

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Vitreous degeneration - syneresis

A liquefaction of the vitreous gel which may predispose to retinal detachment.

G. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that one form of PRA in the Japanese Chin is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
JAPANESE CHIN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,285 #	%	2018-2022 224 #	%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	13	1.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	99	7.7%	19	8.5%
22.000 ECTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110 DISTICHIASIS	56	4.4%	11	4.9%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.1%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.1%	2	0.9%
GLOBE				
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.4%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	2	0.2%	0	0.0%
CORNEA				
70.210 PANNUS	9	0.7%	2	0.9%
70.220 PIGMENTARY KERATITIS	47	3.7%	10	4.5%
70.700 CORNEAL DYSTROPHY	3	0.2%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	3	0.2%	1	0.4%
UVEA				
93.150 IRIS COLOBOMA	1	0.1%	1	0.4%
93.170 ANTERIOR CHAMBER CYST	1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	138	10.7%	11	4.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	6	0.5%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	7	0.5%	1	0.4%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	6	0.5%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	0	0.0%
FUNDUS				
97.120 COLOBOMA	1	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.4%
120.960 RETINOPATHY	0	0.0%	1	0.4%
130.150 OPTIC DISC COLOBOMA	0	0.0%	1	0.4%
LENS				
100.200 CATARACT, UNSPECIFIED	1	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	60	4.7%	9	4.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	25	1.9%	3	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	11	0.9%	1	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	8	0.6%	2	0.9%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	5	0.4%	3	1.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.3%	4	1.8%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.1%	1	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	4	0.3%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	46	3.6%	12	5.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	30	2.3%	3	1.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	26	2.0%	3	1.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	9	0.7%	1	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS	7	0.5%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	12	0.9%	3	1.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	6	0.5%	2	0.9%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	2	0.9%
100.328 Y-SUTURE TIP OPACITIES	1	0.1%	2	0.9%
100.330 GENERALIZED/ COMPLETE CATARACT	7	0.5%	1	0.4%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.4%

OCULAR DISORDERS REPORT
JAPANESE CHIN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,285 #	 %	Year Examined: 2018-2022 Total # Dogs: 224 #	 %
LENS Continued				
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	6	0.5%	2	0.9%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***204***	***15.9%***	***42***	***18.8%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	15	1.2%	5	2.2%
110.135 PHPV/ PTVL	13	1.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	11	0.9%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	52	4.0%	11	4.9%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	0.2%	1	0.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	15	1.2%	1	0.4%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.1%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	2	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	28	2.2%	0	0.0%
900.100 OTHER, NOT INHERITED	46	3.6%	1	0.4%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	46	3.6%	21	9.4%
NORMAL				
.000 NORMAL GLOBE	815	63.4%	114	50.9%

JINDO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the JINDO breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
JINDO

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 8 #	 %	Year Examined: 2018-2022 Total # Dogs: 17 #	 %
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	1	5.9%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	5.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	12.5%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	5.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	12.5%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	5.9%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***2***	***25.0%***	***1***	***5.9%***
NORMAL					
.000	NORMAL GLOBE	7	87.5%	15	88.2%

KAI KEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- lens pigment foci/no strands	Not defined	1	Passes with no notation

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
KAI KEN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 8 #	 %	Year Examined: 2018-2022 Total # Dogs: 33 #	 %
CORNEA				
70.700 CORNEAL DYSTROPHY	0	0.0%	1	3.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	12.5%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	4	50.0%	10	30.3%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	2	6.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	3.0%
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	3.0%
100.317 INCIPIENT CATARACT, CAPSULAR	0	0.0%	1	3.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***0***	***0.0%***	***3***	***9.1%***
RETINA				
120.960 RETINOPATHY	0	0.0%	1	3.0%
NORMAL				
.000 NORMAL GLOBE	4	50.0%	19	57.6%

KARELIAN BEAR DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- (*prcd)*	Autosomal recessive	1	NO	Mutation of the *prcd* gene

Description and Comments

A. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited. A genetic test is available to detect the progressive rod cone degeneration form of PRA caused by a mutation in the *prcd*-gene. A second form of PRA is also present in the Karelian Bear Dog for which the causative mutation is not yet known.

References

1. Ahonen S, Lohi H, editors. Progressive retinal atrophy in the Karelian Bear Dog: A large animal model for retinitis pigmentosa. ARVO Abstract 2014 Annual Meeting; 2014; Orlando, FL. Program number: 3270.

OCULAR DISORDERS REPORT
KARELIAN BEAR DOG

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 108 #	 %	Year Examined: 2018-2022 Total # Dogs: 17 #	 %
EYELIDS					
25.110	DISTICHIASIS	2	1.9%	0	0.0%
CORNEA					
70.220	PIGMENTARY KERATITIS	0	0.0%	1	5.9%
70.700	CORNEAL DYSTROPHY	4	3.7%	1	5.9%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.9%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	10	9.3%	2	11.8%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	2.8%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	1.9%	1	5.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	5.9%
100.307	PUNCTATE CATARACT, CAPSULAR	2	1.9%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	3	2.8%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	4	3.7%	1	5.9%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	0	0.0%	1	5.9%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.9%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.9%	1	5.9%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	2	11.8%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***11***	***10.2%***	***6***	***35.3%***
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	4	3.7%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.9%	0	0.0%
120.960	RETINOPATHY	1	0.9%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	1	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	1	0.9%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.9%	2	11.8%
NORMAL					
.000	NORMAL GLOBE	82	75.9%	8	47.1%

KEESHOND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Y-suture tip opacity	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

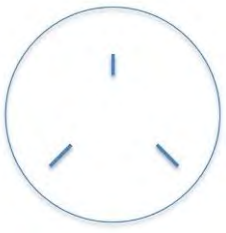
Eyelashes abnormally located in the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either

be breeder option or failing.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
KEESHOND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	3,447		641	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.0%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	9	0.3%	2	0.3%
25.110	DISTICHIASIS	200	5.8%	20	3.1%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
CORNEA					
70.220	PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	12	0.3%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
UVEA					
93.120	IRIS CYST	2	0.1%	0	0.0%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	30	0.9%	5	0.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.1%	1	0.2%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	0	0.0%
FUNDUS					
97.120	COLOBOMA	1	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.2%
130.110	MICROPAPILLA	0	0.0%	1	0.2%
LENS					
100.200	CATARACT, UNSPECIFIED	18	0.5%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	314	9.1%	49	7.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	17	0.5%	6	0.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	21	0.6%	3	0.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	12	0.3%	1	0.2%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	135	3.9%	37	5.8%
100.306	PUNCTATE CATARACT, NUCLEUS	8	0.2%	9	1.4%
100.307	PUNCTATE CATARACT, CAPSULAR	20	0.6%	8	1.2%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	7	0.2%	2	0.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	39	1.1%	2	0.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	9	0.3%	1	0.2%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	23	0.7%	12	1.9%
100.316	INCIPIENT CATARACT, NUCLEUS	15	0.4%	2	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	11	0.3%	3	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	1	0.2%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	1	0.2%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	1	0.2%
100.328	Y-SUTURE TIP OPACITIES	74	2.1%	103	16.1%
100.330	GENERALIZED/ COMPLETE CATARACT	7	0.2%	1	0.2%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***352***	***10.2%***	***91***	***14.2%***

OCULAR DISORDERS REPORT
KEESHOND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,447 #	 %	Year Examined: 2018-2022 Total # Dogs: 641 #	 %
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.0%	2	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS	9	0.3%	2	0.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	6	0.2%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	10	0.3%	1	0.2%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
120.960 RETINOPATHY	4	0.1%	1	0.2%
OPTIC NERVE				
130.110 MICROPAPILLA	8	0.2%	1	0.2%
130.120 OPTIC NERVE HYPOPLASIA	13	0.4%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	21	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED	45	1.3%	3	0.5%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	33	1.0%	35	5.5%
NORMAL				
.000 NORMAL GLOBE	2,757	80.0%	450	70.2%

KERRY BLUE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
KERRY BLUE TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 757 #	%	2018-2022 111 #	%
EYELIDS				
25.110 DISTICHIASIS	12	1.6%	4	3.6%
CORNEA				
70.210 PANNUS	1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY	3	0.4%	3	2.7%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	11	1.5%	4	3.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	1	0.9%
LENS				
100.200 CATARACT, UNSPECIFIED	6	0.8%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	30	4.0%	1	0.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	16	2.1%	1	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.4%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	3	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.1%	1	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	4	0.5%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	3	0.4%	1	0.9%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	6	0.8%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***44***	***5.8%***	***3***	***2.7%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.4%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	7	0.9%	1	0.9%
RETINA				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2	0.3%	1	0.9%
OTHER				
900.000 OTHER, UNSPECIFIED	1	0.1%	0	0.0%
900.100 OTHER, NOT INHERITED	21	2.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	0.5%	3	2.7%
NORMAL				
.000 NORMAL GLOBE	668	88.2%	95	85.6%

KISHU-KEN

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the KISHU-KEN breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
KISHU KEN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2 #	 %	2018-2022 11 #	 %
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	2	18.2%
LENS				
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	2	18.2%
NORMAL				
.000 NORMAL GLOBE	2	100.0%	7	63.6%

KOMONDOR

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Appears to be relatively young age for onset in the Komondor (<4yr) and mainly anterior cortical.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
KOMONDOR

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 361 #	 %	Year Examined: 2018-2022 Total # Dogs: 44 #	 %
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	1	0.3%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	1	0.3%	0	0.0%
25.110	DISTICHIASIS	0	0.0%	1	2.3%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.3%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	1	0.3%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	5	1.4%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.6%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	14	3.9%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	28	7.8%	1	2.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.3%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.6%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.3%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	5	1.4%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.8%	1	2.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	3	0.8%	2	4.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	5	1.4%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.3%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	4	1.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	5	1.4%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.3%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	1	0.3%	1	2.3%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.3%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***46***	***12.7%***	***3***	***6.8%***
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	1	0.3%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	7	1.9%	0	0.0%
900.100	OTHER, NOT INHERITED	6	1.7%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.3%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	296	82.0%	40	90.9%

KOREAN POONGSAN

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the KOREAN POONGSAN breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
KOREAN POONGSAN

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	1		0	
Diagnostic Name	**#**	**%**	**#**	**%**
NORMAL				
.000 NORMAL GLOBE	1	100.0%	0	

KROMFORHLANDER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the KROMFORHLANDER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
KROMFOHRLANDER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 6 #	%	Year Examined: 2018-2022 Total # Dogs: 10 #	%
NORMAL				
.000 NORMAL GLOBE	6	100.0%	10	100.0%

KUVASZ

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1	NO	Mutation of the *prcd* gene

Description and Comments

A. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the form of PRA in the Kuvasz is *prcd*, which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

OCULAR DISORDERS REPORT
KUVASZ

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	550		7	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	2	0.4%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.2%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	1	0.2%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	2	0.4%	0	0.0%
25.110	DISTICHIASIS	21	3.8%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.2%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	6	1.1%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.2%	0	0.0%
UVEA					
93.150	IRIS COLOBOMA	2	0.4%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	23	4.2%	0	0.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.5%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.5%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	2	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	15	2.7%	1	14.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.2%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.2%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.2%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	14.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.2%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	3	0.5%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	14.3%
100.330	GENERALIZED/ COMPLETE CATARACT	5	0.9%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***16***	***2.9%***	***1***	***14.3%***
VITREOUS					
110.320	VITREOUS DEGENERATION SYNERESIS	1	0.2%	0	0.0%
RETINA					
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	4	0.7%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	1	0.2%	0	0.0%
900.100	OTHER, NOT INHERITED	12	2.2%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	0.7%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	461	83.8%	5	71.4%

KYI-LEO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the KYI-LEO breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
KYI-LEO

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2 #	 %	2018-2022 1 #	 %
RETINA				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	50.0%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	1	50.0%	1	100.0%

LABRADOR RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Ectropion	Not defined	1	Breeder option	
C.	Distichiasis	Not defined	1	Breeder option	
D.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1-3	Breeder option	
	- macular	Autosomal recessive	1-3	NO	
E.	Uveal cysts	Not defined	1	Breeder option	
F.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
G.	Cataract				
	- generalized	Not defined	1, 5	NO	
	- posterior polar/posterior cortical/subcapsular	Presumed dominant with incomplete penetrance	1-4	NO	
H.	Y-suture tip opacity	Not defined	1	Breeder option	
I.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
J.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
K.	Retinal degeneration				
	- *(prcd)*	Autosomal recessive	1, 6-8	NO	Mutation of the *prcd* gene
	- Stargardt's disease	Autosomal recessive	1, 9-10	NO	Mutation of the *ABCA4* gene
L.	Achromatopsia Type 2 (*ACHM – Type 2)*	Autosomal recessive	11, 12	NO	Mutation of the *CNGA3* gene
M.	Retinal dysplasia				
	- folds	Not defined	1	NO (Breeder option with normal DNA test for mutation in the *CNGA3* gene	Mutation of the *COL9A3* gene for some cases, otherwise unknown
	- geographic	Not defined	1, 22, 23	NO	
	- detached/generalized	Autosomal recessive	13, 14	NO	
N.	Retinal dysplasia				
	- folds/retinal detachment (with skeletal defects)	Autosomal recessive	15-22, 24	NO	Mutation of the *COL9A3* gene
O.	Limbal melanoma	Not defined	25	NO	

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward a head conformation that reduces or eliminates the likelihood of the defect.

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Corneal dystrophy - epithelial/stromal/macular

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

In Labrador Retrievers in Europe, macular corneal dystrophy (MCD) has been shown to be caused by accumulations of glycosaminoglycans in the corneal stroma. This form of corneal dystrophy is caused by a mutation in the CHST6 gene.

E. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

This disorder may be observed in any breed but retriever breeds tend to be predisposed. There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

F. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Labrador Retriever, this is a potentially serious problem as many of the PPMs identified on routine screening examinations bridge from the iris to the cornea and/or from iris sheets bridging the pupils. These forms may cause vision impairment.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

G. Cataract

- generalized

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

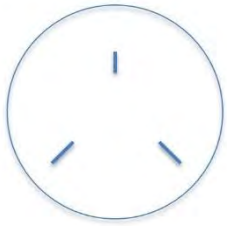
- posterior polar/posterior cortical/subcapsular

The most frequently reported cataracts in the Labrador Retriever are bilateral or unilateral, focal, posterior polar (posterior cortical)/subcapsular cataracts which usually present between 1-3 years of age. These are generally stationary or very slowly progressive and generally do not interfere with vision. It has been suggested that these cataracts are inherited as dominant with incomplete penetrance, but definitive breeding studies are still required to verify this hypothesis.

A second type of cataract is a progressive cortical cataract which may involve the entire lens. It is not clear whether this is a distinct entity, or an aberrant form of the posterior polar cataract.

H. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

I. Persistent hyaloid artery remnant (PHA)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

J. Vitreous degeneration

Liquefaction of the vitreous gel, which may predispose to retinal detachment.

K. Retinal degeneration-

- prcd

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as

progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Labrador Retriever is prcd which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (prcd) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

- Stargardt's Disease

Degenerative disease of visual cells and RPE caused by an autosomal recessive mutation in the gene ABCA4. While the retina does degenerate with progression of the disease, the ophthalmoscopic findings are different from PRA. Focal atrophy of the center of the area centralis occurs in young dogs, as well as markedly reduced or absent cone ERG responses.

L. Achromatopsia Type 2 (ACHM – Type 2)

A congenital form of day blindness. Visual deficits become apparent between 8-10 weeks of age. Normal vision is present in low light conditions. Clinical examination is normal. Cone responses are absent on an electroretinogram. The causative genetic mutation has been determined, but not yet published. A DNA test is available.

M. Retinal dysplasia

- folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown.

In the Labrador Retriever, the presence of retinal folds may be seen in the heterozygous state of oculoskeletal dysplasia (described below), thus the recommendation against breeding.

The breeding advice for Labrador Retrievers and Samoyeds diagnosed with "retinal dysplasia - folds" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the COL9A3 mutation.

- geographic

An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

- detached/generalized:

Abnormal development of the retina occurring in late gestation resulting in retinal detachment and blindness by 8 weeks of age. This disease was described in Sweden in the 1970s and appears to have been eliminated.

N. Retinal dysplasia - folds or detachment with skeletal defects

This condition is also known as oculo-skeletal dysplasia (OSD) or dwarfism with retinal dysplasia type 1 (DRD1) in the Labrador Retriever. A similar condition, DRD2, occurs in the Samoyed. The condition is autosomal recessive and homozygous affected dogs have shortened forelimbs ("downhill" conformation) with valgus deformity. They

have severe ocular defects including cataract, retinal folds/multifocal retinal dysplasia, vitreal degeneration and retinal detachment. The ocular abnormalities result in blindness in most dogs. Heterozygous dogs can have either a normal ocular exam or have multiple retinal folds, vitreal membranes, or vitreal degeneration. It is important to note that generally the retinal folds present in heterozygous dogs tend to cluster around the major superior blood vessels of the central tapetal region. The condition is caused by a 1 base pair insertion of COL9A3. A DNA test is available.

O. Limbal melanoma

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predisposition have been noted in the German Shepherd, Labrador and Golden Retriever.

Historical Note:

Central progressive retinal atrophy was previously a condition listed for Labrador Retriever. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Pont RT, Downs L, Pettitt L, et al. A Carbohydrate sulfotransferase-6 (CHST6) gene mutation is associated with Macular Corneal Dystrophy in Labrador Retrievers. Vet Ophthalmol. 2016;19:488-492. PMID: 26585178 **reference derived from non-USA dog population**

3. Busse, C., et al. (2019). Phenotype of macular corneal dystrophy in Labrador Retrievers: A multicenter study. Vet Ophthalmol 22(3): 294-304. PMID: 30701649

4. Curtis R, Barnett KC. A survery of cataracts in Golden and Labrador Retrievers. J Small Anim Pract. 1989;30:277-286. **reference derived from non-USA dog population**

.

5. Kraijer-Huver IM, Gubbels EJ, Scholten J, et al. Characterization and prevalence of cataracts in Labrador Retrievers in The Netherlands. Am J Vet Res. 2008;69:1336-1340. PMID: 18828692 **reference derived from non-USA dog population**

6. Aguirre GD, Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. Exp Eye Res. 1988;46:663-687. PMID: 3164273

7. Kommonen B, Karhunen U. A late receptor dystrophy in the Labrador Retriever. Vision Res. 1990;30:207-213. PMID: 2309455 **reference derived from non-USA dog population**

8. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. Genomics. 2006;88:551-563. PMID: 16938425

9. Makelainen, S., et al. (2019). An ABCA4 loss-of-function mutation causes a canine form of Stargardt

disease. PLoS Genet 15(3): e1007873. PMID: 30889179

10. Ekesten B, Makelainen S, Ellis S, et al. Abnormal appearance of the area centralis in Labrador Retrievers with ABCA4 loss-of-function mutation. Transl Vis Sci Technol 2022; 11: doi: 10.1167/tvst.11.2.36 PMID: 35201338

11. Dixon CJ. Achromatopsia in three sibling Labrador Retrievers in the UK. Vet Ophthalmol. 2016;19:68-72. PMID: 25752464 **reference derived from non-USA dog population**

12. Tanaka N, Dutrow EV, Miyadera K, et al. Canine CNGA3 gene mutations provide novel insights into human achromatopsia-associated channelopathies and treatment. PLoS ONE 10(9): 30138943. PMID: 26407004

13. Barnett KC, et al. Hereditary retinal dysplasia in the Labrador Retriever in England and Sweden. J Small Anim Pract. 1970;10:755-759. **reference derived from non-USA dog population**

14. Kock E. Retinal dysplasia. Thesis, Stockholm, 1974. **reference derived from non-USA dog population**

15. Carrig CB, MacMillan A, Brundage S, et al. Retinal dysplasia associated with skeletal abnormalities in Labrador Retrievers. J Am Vet Med Assoc. 1977;170:49-57. PMID: 830631

16. Carrig CB, Schmidt GM, Tvedten HML. Growth of the radius and ulna in Labrador Retriver dogs with ocular and skeletal dysplasia. Vet Radiol. 1990;31:165-168.

17. Carrig CB, Sponenberg DP, Schmidt GM, et al. Inheritance of associated ocular and skeletal dysplasia in Labrador Retrievers. J Am Vet Med Assoc. 1988;193:1269-1272. PMID: 3204050

18. Nelson D, MacMillan A. Multifocal retinal dysplasia in the field trial Labrador Retriever. J Am Anim Hosp Assoc. 1983;19:388-392.

19. Blair NP, Dodge JT, Schmidt GM. Rhegmatogenous retinal detachment in Labrad
or Retrievers. II. Proliferative vitreoretinopathy. Arch Ophthalmol. 1985;103:848-854. PMID: 4004628

20. Blair NP, Dodge JT, Schmidt GM. Rhegmatogenous retinal detachment in Labrador Retrievers. I. Development of retinal tears and detachment. Arch Ophthalmol. 1985;103:842-847. PMID: 4004627

21. Gionfriddo JR, Betts DM, Niyo Y. Retinal and skeletal dysplasia in a field trial Labrador puppy. Canine Pract. 1992;17:25-29.

22. Iwabe, S., et al. (2020). "Focal/multifocal and geographic retinal dysplasia in the dog-In vivo retinal microanatomy analyses." Vet Ophthalmol 23(2): 292-304. PMID: 31746146

23. In vivo imaging comparison of unilateral circular retinal plaques in retriever dogs to dysplasia and detachment in the English Springer Spaniel. Osinchuk SC, Sandmeyer LS, Grahn BH.Vet Ophthalmol. 2020 Nov;23(6):957-963. doi: 10.1111/vop.12828. Epub 2020 Sep 29.PMID: 32990375

24. Goldstein O, Guyon R, Kukekova A, et al. COL9A2 and COL9A3 mutations in canine autosomal recessive oculoskeletal dysplasia. Mamm Genome. 2010;21:398-408. PMID: 20686772

25. Donaldson D, Sansom J, Scase T, et al. Canine limbal melanoma: 30 cases (1992-2004). Part 1. Signalment, clinical and histological features and pedigree analysis. Vet Ophthalmol. 2006;9:115-119. PMID: 16497236

OCULAR DISORDERS REPORT
LABRADOR RETRIEVER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	246,533		37,176	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	62	0.0%	5	0.0%
10.000	GLAUCOMA	28	0.0%	3	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	2	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	16	0.0%	2	0.0%
20.160	MACROPALPEBRAL FISSURE	86	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	1,069	0.4%	202	0.5%
22.000	ECTROPION, UNSPECIFIED	516	0.2%	47	0.1%
25.110	DISTICHIASIS	2,407	1.0%	369	1.0%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	12	0.0%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	32	0.0%	12	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	8	0.0%	2	0.0%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	0	0.0%	2	0.0%
51.100	THIRD EYELID CARTILAGE ANOMALY	11	0.0%	2	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	38	0.0%	2	0.0%
CORNEA					
70.210	PANNUS	9	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	19	0.0%	9	0.0%
70.700	CORNEAL DYSTROPHY	2,422	1.0%	387	1.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	84	0.0%	10	0.0%
UVEA					
90.250	PIGMENTARY UVEITIS	2	0.0%	2	0.0%
93.110	IRIS HYPOPLASIA	6	0.0%	1	0.0%
93.120	IRIS CYST	381	0.2%	90	0.2%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	12	0.0%	0	0.0%
93.150	IRIS COLOBOMA	12	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	42	0.0%	17	0.0%
93.180	IIRIS SPHINCTER DYSPLASIA	1	0.0%	1	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	7,485	3.0%	1,295	3.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	154	0.1%	13	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	162	0.1%	7	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	176	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	415	0.2%	430	1.2%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	33	0.0%	10	0.0%
93.810	UVEAL MELANOMA	67	0.0%	22	0.1%
95.120	CILIARY BODY CYST	32	0.0%	16	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	14	0.0%	0	0.0%
97.120	COLOBOMA	11	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	121	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	65	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	8	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	2	0.0%
120.960	RETINOPATHY	0	0.0%	13	0.0%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.0%
130.110	MICROPAPILLA	0	0.0%	10	0.0%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.0%
130.150	OPTIC DISC COLOBOMA	0	0.0%	2	0.0%

OCULAR DISORDERS REPORT
LABRADOR RETRIEVER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 246,533 #	 %	2018-2022 37,176 #	 %
LENS				
100.200 CATARACT, UNSPECIFIED	728	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	10,775	4.4%	1,726	4.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1,903	0.8%	923	2.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1,486	0.6%	241	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	274	0.1%	79	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	210	0.1%	64	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1,109	0.4%	329	0.9%
100.306 PUNCTATE CATARACT, NUCLEUS	345	0.1%	158	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	617	0.3%	325	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	795	0.3%	165	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	2,037	0.8%	315	0.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	562	0.2%	107	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	68	0.0%	9	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	509	0.2%	76	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS	352	0.1%	73	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	309	0.1%	141	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	20	0.0%	24	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	76	0.0%	52	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	22	0.0%	11	0.0%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	11	0.0%	10	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	16	0.0%	16	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	14	0.0%	17	0.0%
100.328 Y-SUTURE TIP OPACITIES	364	0.1%	389	1.0%
100.330 GENERALIZED/ COMPLETE CATARACT	357	0.1%	5	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	5	0.0%	5	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	55	0.0%	4	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***11,826***	***4.8%***	***3,145***	***8.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	632	0.3%	134	0.4%
110.135 PHPV/ PTVL	156	0.1%	14	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	48	0.0%	17	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	844	0.3%	170	0.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	5,221	2.1%	233	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2,067	0.8%	96	0.3%
120.190 RETINAL DYSPLASIA, DETACHED	186	0.1%	10	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	994	0.4%	8	0.0%
120.400 RETINAL HEMORRHAGE	34	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	73	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	8	0.0%	5	0.0%
120.960 RETINOPATHY	70	0.0%	31	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	109	0.0%	14	0.0%
130.120 OPTIC NERVE HYPOPLASIA	89	0.0%	2	0.0%
130.150 OPTIC DISC COLOBOMA	45	0.0%	4	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1,697	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	4,335	1.8%	18	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2,592	1.1%	1,405	3.8%
NORMAL				
.000 NORMAL GLOBE	211,437	85.8%	29,883	80.4%

LAGOTTO ROMAGNOLO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Not defined	1, 4	NO	
D.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
E.	Retinal atrophy				
	- *(prcd)*	Autosomal recessive	2, 3	NO	Mutation of the *prcd* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

E. Retinal atrophy – prcd

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Lagotto Romagnolo is prcd which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (prcd) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

3. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4): e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1): e1007938. PMID: 29708978; PMCID: PMC5945203.

4. Arteaga K, Leiva M, M. Pena T, Ostan P, Crasta M. A Retrospective Evaluation of the Incidence of Hereditary Ocular Disorders in Lagotto Romagnolo Dog Breed in Italy. ECVO 2021 abstract PMID: 35285574 **reference derived from non-USA dog population**

OCULAR DISORDERS REPORT
LAGOTTO ROMAGNOLO

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	514		1,262	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	0	0.0%	1	0.1%
EYELIDS					
25.110	DISTICHIASIS	45	8.8%	115	9.1%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.2%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.2%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	0	0.0%	1	0.1%
UVEA					
93.120	IRIS CYST	1	0.2%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	14	2.7%	116	9.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	1	0.1%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	4	0.8%	25	2.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	0	0.0%	1	0.1%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	10	1.9%	37	2.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	6	1.2%	18	1.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.2%	6	0.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.8%	3	0.2%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.2%	3	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.2%	8	0.6%
100.306	PUNCTATE CATARACT, NUCLEUS	1	0.2%	1	0.1%
100.307	PUNCTATE CATARACT, CAPSULAR	0	0.0%	7	0.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	6	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	3	0.2%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.4%	3	0.2%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	5	0.4%
100.317	INCIPIENT CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.4%	1	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.4%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.2%	1	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.2%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	11	0.9%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	0	0.0%	1	0.1%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***22***	***4.3%***	***67***	***5.3%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.2%	17	1.3%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	4	0.8%	2	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
120.960	RETINOPATHY	0	0.0%	1	0.1%
FUNDUS					
120.960	RETINOPATHY	0	0.0%	2	0.2%
130.150	OPTIC DISC COLOBOMA	0	0.0%	1	0.1%
OPTIC NERVE					
130.110	MICROPAPILLA	2	0.4%	4	0.3%

OCULAR DISORDERS REPORT
LAGOTTO ROMAGNOLO

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 514 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,262 #	 %
OTHER				
900.000 OTHER, UNSPECIFIED	3	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED	0	0.0%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	13	2.5%	30	2.4%
NORMAL				
.000 NORMAL GLOBE	428	83.3%	940	74.5%

LAKELAND TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder Option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
B.	Lens luxation	Autosomal recessive	2	NO	Mutation of the *ADAMTS17* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

B. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011; 14: 378-384. PMID: 22050825

OCULAR DISORDERS REPORT
LAKELAND TERRIER

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 250 #	 %	Year Examined: 2018-2022 Total # Dogs: 36 #	 %
EYELIDS					
25.110	DISTICHIASIS	9	3.6%	3	8.3%
CORNEA					
70.700	CORNEAL DYSTROPHY	1	0.4%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.8%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	36	14.4%	3	8.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.8%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	4	1.6%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.4%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	8	3.2%	6	16.7%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	2.0%	1	2.8%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.4%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	2	5.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	3	1.2%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	4	1.6%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	2.8%
100.330	GENERALIZED/ COMPLETE CATARACT	3	1.2%	1	2.8%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***11***	***4.4%***	***3***	***8.3%***
RETINA					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.4%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	2	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	6	2.4%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	191	76.4%	25	69.4%

LANCASHIRE HEELER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membrane				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/ no strands		1	Passes with no notation	
B.	Lens luxation	Autosomal recessive	2-4	NO	Mutation of the *ADAMTS17* gene
C.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Autosomal recessive	5-7	NO	Deletion in the *NHEJ1* gene
D.	Retinal atrophy				
	- *(prcd)*	Autosomal recessive	8, 9	NO	Mutation of the *prcd* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in ADAMTS17 has been associated with primary lens luxation. A DNA test is available.

C. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is

caused by a 7799 base pair deletion with the gene NHEJ1. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

D. Retinal Atrophy – prcd

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Lancashire Heeler is prcd which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (prcd) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Sargan DR, Withers D, Pettitt L, et al. Mapping the mutation causing lens luxation in several terrier breeds. J Hered. 2007;98:534-538. PMID: 17573382 **reference derived from non-USA dog population**

3. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. Invest Ophthalmol Vis Sci. 2010;51:4716-4721. PMID: 20375329

4. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. Vet Ophthalmol. 2011;14:378-384. PMID: 22050825

5. Bedford PG. Collie eye anomaly in the Lancashire Heeler. Vet Rec. 1998;143:354-356. PMID: 9800301 **reference derived from non-USA dog population**

6. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. Gen Res. 2007;17:1562-1571. PMID: 17916641

7. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for Collie eye anomaly. Genomics. 2003;82:86-95. PMID: 12809679

8. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

9. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
LANCASHIRE HEELER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 152 #	%	2018-2022 58 #	%
EYELIDS				
25.110 DISTICHIASIS	1	0.7%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	0	0.0%	2	3.4%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	59	38.8%	7	12.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.7%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	1.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	10	17.2%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.7%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.7%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***0.7%***	***0***	***0.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	1.3%	1	1.7%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	2.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	2	1.3%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	0.7%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.7%	0	0.0%
OTHER				
900.100 OTHER, SUSPECT INHERITED	0	0.0%	1	1.7%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.7%	3	5.2%
NORMAL				
.000 NORMAL GLOBE	102	67.1%	36	62.1%

LAPPONIAN HERDER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC TESTS AVAILABLE
A.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- *prcd*	Autosomal recessive	2	NO	Mutation of the *prcd* gene
	- *IFT122*	Autosomal recessive	3	NO	Mutation in *IFT122* gene
B.	Multifocal retinopathy - *cmr3*	Autosomal recessive	4	NO (Breeder option with Normal DNA test for CMR)	Mutation of the *BEST1* gene
C.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	5	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Retinal atrophy

– generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Studies have shown that the principal form of PRA in the Lapponian Herder is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

- IFT122

Retinal atrophy in the Lapponian Herder also occurs as an autosomal recessive disorder due to a mutation in the gene *IFT122.* The disease is late onset, occurring at 1-5 years of age and possible later, but usually definitively evident by 9 years of age. Progression is slow, with some dogs retaining vision for up to 13 years. Clinical findings include nyctalopia, diffuse tapered hyper-reflectivity and retinal vessel attenuation.

B. Multifocal retinopathy (*cmr3*)

Canine Multifocal Retinopathy type 3 (*cmr3*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Clinically the disease is similar to that seen in the Bullmastiff and Coton deTulear, but the mutation in the Bestrophin 1 gene (*BEST1* alias *VMD2*) is different. The multifocal retinopathy seen in the Lapponian Herder is caused by a deletion at position 1,388 and a substitution at position 1,466 and is therefore called cmr3. A DNA test is available.

The breeding advice for Coton de Tulear, Lapponian Herders, and Mastiffs diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

C. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Lapponian Herder. The conditions listed above are currently noted solely due to the availability of a genetic test for the disease.

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

3. Kaukonen M, Pettinen IT, Wickström K, Arumilli M, Donner J, Juhola IJ, Holopainen S, Turunen

JA, Yoshihara M, Kere J, Lohi H. A missense variant in IFT122 associated with a canine model of retinitis pigmentosa. Hum Genet. 2021 Nov;140(11):1569-1579. doi: 10.1007/s00439-021-02266-3. Epub 2021 Feb 19. PMID: 33606121 **reference derived from non-USA dog population**

4. Zangerl B, Wickstrom K, Slavik J, et al. Assessment of canine BEST1 variations identifies new mutations and establishes an independent bestrophinopathy model (cmr3). *Mol Vis*. 2010;16:2791-2804. PMID: 21197113

5. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
LAPPONIAN HERDER

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	1		2	
Diagnostic Name	**#**	**%**	**#**	**%**
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	1	50.0%
NORMAL				
.000 NORMAL GLOBE	1	100.0%	1	50.0%

LARGE MUNSTERLANDER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the LARGE MUNSTERLANDER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
LARGE MUNSTERLANDER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 0 #	%	Year Examined: 2018-2022 Total # Dogs: 2 #	%
NORMAL				
.000 NORMAL GLOBE	0		2	100.0%

LEONBERGER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
E.	Uveal cysts	Not defined	1	Breeder option
F.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined		Passes with no notation
G.	Cataract	Not defined	1, 2	NO
H.	Persistent hyaloid artery remnant	Not defined	1	Breeder option
I.	Retinal dysplasia			
	– folds	Not defined	1	Breeder option

Description and Comments

A. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding

dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

E. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

F. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

H. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Heinrich CL, Lakhani KH, Featherstone HJ, et al. Cataract in the UK Leonberger population. *Vet*

Ophthalmol. 2006 Sep-Oct;9:350-356. PMID: 16939464 **reference derived from non-USA dog population**

OCULAR DISORDERS REPORT
LEONBERGER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,078 #	 %	Year Examined: 2018-2022 Total # Dogs: 726 #	 %
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	35	1.7%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	70	3.4%	33	4.5%
22.000 ECTROPION, UNSPECIFIED	29	1.4%	13	1.8%
25.110 DISTICHIASIS	51	2.5%	16	2.2%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	30	1.4%	15	2.1%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	2	0.1%	1	0.1%
CORNEA				
70.700 CORNEAL DYSTROPHY	5	0.2%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	1	0.0%	1	0.1%
93.120 IRIS CYST	17	0.8%	4	0.6%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	4	0.6%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	446	21.5%	179	24.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.1%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	14	0.7%	7	1.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	1	0.1%
93.810 UVEAL MELANOMA	1	0.0%	0	0.0%
95.120 CILIARY BODY CYST	0	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	166	8.0%	69	9.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	38	1.8%	32	4.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	31	1.5%	9	1.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	5	0.2%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	11	0.5%	2	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	17	0.8%	5	0.7%
100.306 PUNCTATE CATARACT, NUCLEUS	19	0.9%	22	3.0%
100.307 PUNCTATE CATARACT, CAPSULAR	26	1.3%	21	2.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	11	0.5%	8	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	36	1.7%	7	1.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.1%	1	0.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	5	0.2%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	10	0.5%	4	0.6%
100.316 INCIPIENT CATARACT, NUCLEUS	22	1.1%	17	2.3%
100.317 INCIPIENT CATARACT, CAPSULAR	8	0.4%	6	0.8%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	3	0.4%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	8	0.4%	3	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT	4	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	7	0.3%	1	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***249***	***12.0%***	***141***	***19.4%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	4	0.2%	8	1.1%
110.135 PHPV/ PTVL	5	0.2%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.1%	0	0.0%

OCULAR DISORDERS REPORT
LEONBERGER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,078 #	 %	Year Examined: 2018-2022 Total # Dogs: 726 #	 %
VITREOUS Continued				
110.320 VITREOUS DEGENERATION SYNERESIS	4	0.2%	2	0.3%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	6	0.8%
130.110 MICROPAPILLA	0	0.0%	1	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	13	0.6%	4	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	4	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	0.2%	0	0.0%
120.960 RETINOPATHY	1	0.0%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	2	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	32	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED	53	2.6%	3	0.4%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	32	1.5%	47	6.5%
NORMAL				
.000 NORMAL GLOBE	1,335	64.2%	375	51.7%

LHASA APSO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Cataract	Not defined	2	NO	
C.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- *IMPG2*	Autosomal recessive	3	NO	Mutation in the *IMPG2* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- IMPG2

An autosomal recessive mutation in IMPG2, previously known as PRA-type 4, has been described in Lhasa Apsos with retinal atrophy in the United Kingdom. The exact age of onset is unknown and clinical progression has not yet been described. Diagnosed cases ranged in age from 1-12 years, with a median of 7 years of age. Dogs with this mutation have bilateral tapetal hyper-reflectivity with vascular attention. Secondary cataracts are also possible. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gelatt KN, Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol*. 2005;8:101-111. PMID: 32894063

3. Hitti-Malin RJ, Burmeister LM, Ricketts SL, Lewis TW, Pettitt L, Boursnell M, Schofield EC, Sargan D, Mellersh CS. A LINE-1 insertion situated in the promoter of IMPG2 is associated with autosomal recessive progressive retinal atrophy in Lhasa Apso dogs. BMC Genet. 2020 Sep 7;21(1):100. doi: 10.1186/s12863-020-00911-w. PMID: 32894063; PMCID: PMC7487703. **reference derived from non-USA dog population**

OCULAR DISORDERS REPORT
LHASA APSO

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	833		118	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.1%	0	0.0%
EYELIDS					
20.160	MACROPALPEBRAL FISSURE	3	0.4%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	12	1.4%	2	1.7%
25.110	DISTICHIASIS	33	4.0%	2	1.7%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.1%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	3	0.4%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.1%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	4	0.5%	0	0.0%
CORNEA					
70.210	PANNUS	8	1.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	21	2.5%	2	1.7%
70.700	CORNEAL DYSTROPHY	16	1.9%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	1	0.1%	0	0.0%
93.120	IRIS CYST	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	10	1.2%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	1	0.8%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	1	0.1%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.8%
LENS					
100.200	CATARACT, UNSPECIFIED	6	0.7%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	28	3.4%	1	0.8%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	7	0.8%	1	0.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	5	0.6%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	3	0.4%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.1%	1	0.8%
100.306	PUNCTATE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	13	1.6%	3	2.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	15	1.8%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	4	0.5%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	4	0.5%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.2%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	3	0.4%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	2	1.7%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	1	0.1%	1	0.8%
100.330	GENERALIZED/ COMPLETE CATARACT	18	2.2%	1	0.8%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***83***	***10.0%***	***8***	***6.8%***
VITREOUS					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.5%	1	0.8%
110.320	VITREOUS DEGENERATION SYNERESIS	6	0.7%	1	0.8%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	5	0.6%	2	1.7%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	3	0.4%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	7	0.8%	0	0.0%

OCULAR DISORDERS REPORT
LHASA APSO

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 833 #	 %	2018-2022 118 #	 %
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	2	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
OTHER				
900.100 OTHER, NOT INHERITED	12	1.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	21	2.5%	3	2.5%
NORMAL				
.000 NORMAL GLOBE	641	77.0%	96	81.4%

LLEWELLYN SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	2	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
LLEWELLYN SETTER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1 #	%	2018-2022 30 #	%
EYELIDS				
22.000 ECTROPION, UNSPECIFIED	0	0.0%	1	3.3%
25.110 DISTICHIASIS	0	0.0%	1	3.3%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	3.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	2	6.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	3.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	1	3.3%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	3.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	1	3.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	3.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	3.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	3.3%
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	5	16.7%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***0***	***0.0%***	***9***	***30.0%***
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	2	6.7%
NORMAL				
.000 NORMAL GLOBE	1	100.0%	19	63.3%

LOUISIANA CATAHOULA LEOPARD DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
LOUISIANA CATAHOULA LEOPARD DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 397 #	 %	Year Examined: 2018-2022 Total # Dogs: 89 #	 %
GLOBE				
.110 MICROPHTHALMIA	5	1.3%	0	0.0%
EYELIDS				
25.110 DISTICHIASIS	3	0.8%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	0	0.0%	1	1.1%
70.700 CORNEAL DYSTROPHY	1	0.3%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	4	1.0%	1	1.1%
93.150 IRIS COLOBOMA	12	3.0%	1	1.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	41	10.3%	10	11.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	1	1.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	0.3%	2	2.2%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.3%	1	1.1%
97.120 COLOBOMA	2	0.5%	0	0.0%
130.150 OPTIC DISC COLOBOMA	0	0.0%	2	2.2%
LENS				
100.200 CATARACT, UNSPECIFIED	1	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	1.3%	2	2.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.3%	2	2.2%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	1.1%
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	1.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	4	1.0%	2	2.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	3	0.8%	1	1.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.5%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	1.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.3%	1	1.1%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.3%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***13***	***3.3%***	***10***	***11.2%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	0.5%	0	0.0%
110.135 PHPV/ PTVL	0	0.0%	1	1.1%
110.320 VITREOUS DEGENERATION SYNERESIS	2	0.5%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	9	2.3%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.5%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.3%	0	0.0%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	2	0.5%	2	2.2%
OTHER				
900.100 OTHER, NOT INHERITED	4	1.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	12	3.0%	3	3.4%
NORMAL				
.000 NORMAL GLOBE	325	81.9%	65	73.0%

LOWCHEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO
D.	Vitreous degeneration			
	- syneresis	Not defined	1	Breeder option
E.	Retinal atrophy			
	- generalized	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Vitreous degeneration - syneresis

A liquefaction of the vitreous gel which may predispose to retinal detachment and/or glaucoma.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
LOWCHEN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,786 #	%	2018-2022 527 #	%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110 DISTICHIASIS	82	4.6%	46	8.7%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.1%	0	0.0%
CORNEA				
70.210 PANNUS	1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY	0	0.0%	1	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	1	0.1%	0	0.0%
93.150 IRIS COLOBOMA	1	0.1%	2	0.4%
93.170 ANTERIOR CHAMBER CYST	1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	139	7.8%	88	16.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	9	0.5%	16	3.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	2	0.1%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.4%
LENS				
100.200 CATARACT, UNSPECIFIED	21	1.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	58	3.2%	16	3.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	13	0.7%	7	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	13	0.7%	1	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.2%	3	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	8	0.4%	1	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	3	0.2%	2	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	22	1.2%	4	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	24	1.3%	3	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.4%	2	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	4	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.1%	1	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.1%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	1	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	2	0.1%	2	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT	16	0.9%	1	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***147***	***8.2%***	***27***	***5.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	3	0.2%	3	0.6%
110.135 PHPV/ PTVL	1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.2%	2	0.4%
110.320 VITREOUS DEGENERATION SYNERESIS	49	2.7%	8	1.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	3	0.2%	0	0.0%

OCULAR DISORDERS REPORT
LOWCHEN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,786 #	 %	Year Examined: 2018-2022 Total # Dogs: 527 #	 %
RETINA Continued				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.2%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	40	2.2%	1	0.2%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
120.960 RETINOPATHY	5	0.3%	1	0.2%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	13	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	39	2.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	12	0.7%	9	1.7%
NORMAL				
.000 NORMAL GLOBE	1,425	79.8%	351	66.6%

LUCAS TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1, 2	NO	Mutation of the *ADAMTS17* gene

Description and Comments

A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Lucas Terrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011; 14: 378-384.

2. Gould D, Pettitt L, McLaughlin B, Holmes N, Forman O, Thomas A, Ahonen S, Lohi H, O'Leary C, Sargan D, Mellersh C. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. Vet Ophthalmol. 2011 Nov;14(6):378-84. doi: 10.1111/j.1463-5224.2011.00892.x. Epub 2011 Aug 3. PMID: 22050825.

OCULAR DISORDERS REPORT
LUCAS TERRIER

There are no statistics available for this breed

MAGYAR AGAR

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the MAGYAR AGAR breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
MAGYAR AGAR

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4 #	 %	2018-2022 2 #	 %
NORMAL				
.000 NORMAL GLOBE	5	125.0%	2	100.0%

MALTESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Cataract	Not defined	2	NO

Description and Comments

A. Entropion

A conformational defect resulting in inversion of the eyelid margin which may cause ocular irritation. It is likely that entropion is influenced by several factors defining the skin and other structures, which make up the eyelids, orbital contents, and conformation of the skull.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gelatt KN, Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. Vet Ophthalmol. 2005 Mar-Apr;8(2):101-11. doi: 10.1111/j.1463-5224.2005.00352.x. PMID: 15762923.

OCULAR DISORDERS REPORT
MALTESE

	Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 420 #	 %	Year Examined: 2018-2022 Total # Dogs: 286 #	 %
GLOBE					
.110	MICROPHTHALMIA	1	0.2%	2	0.7%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.3%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	6	1.4%	7	2.4%
25.110	DISTICHIASIS	12	2.9%	5	1.7%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.2%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	2	0.5%	0	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.5%	2	0.7%
CORNEA					
70.220	PIGMENTARY KERATITIS	3	0.7%	2	0.7%
70.700	CORNEAL DYSTROPHY	2	0.5%	1	0.3%
UVEA					
93.110	IRIS HYPOPLASIA	0	0.0%	1	0.3%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	19	4.5%	4	1.4%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	1	0.3%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	0.3%
95.120	CILIARY BODY CYST	1	0.2%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	17	4.0%	6	2.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	5	1.2%	5	1.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	5	1.2%	2	0.7%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	3	0.7%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.2%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	4	1.0%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	1	0.2%	1	0.3%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.2%	1	0.3%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	9	2.1%	12	4.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	9	2.1%	2	0.7%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	3	0.7%	1	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.2%	2	0.7%
100.316	INCIPIENT CATARACT, NUCLEUS	2	0.5%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.2%	1	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.2%	1	0.3%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.2%	1	0.3%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	2	0.5%	2	0.7%
100.330	GENERALIZED/ COMPLETE CATARACT	4	1.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***52***	***12.4%***	***30***	***10.5%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.2%	1	0.3%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.5%	1	0.3%
110.320	VITREOUS DEGENERATION SYNERESIS	12	2.9%	2	0.7%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	3	0.7%	1	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	5	1.2%	1	0.3%
120.190	RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.3%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	1.2%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.3%

OCULAR DISORDERS REPORT
MALTESE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 420 #	 %	Year Examined: 2018-2022 Total # Dogs: 286 #	 %
OTHER				
900.000 OTHER, UNSPECIFIED	8	1.9%	0	0.0%
900.100 OTHER, NOT INHERITED	6	1.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	1.9%	9	3.1%
NORMAL				
.000 NORMAL GLOBE	324	77.1%	226	79.0%

MANCHESTER TERRIER

Standard & Toy Varieties

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes - lens pigment foci/ no strands	Not defined	1	Passes with no notation	
B.	Cataract	Not defined	1	NO	
C.	Retinal atrophy - (*prcd*)	Autosomal recessive	2	NO	Mutation of the *prcd* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal Atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Manchester Terrier is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2 Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and

distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
MANCHESTER TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 255 #	 %	2018-2022 169 #	 %
EYELIDS				
25.110 DISTICHIASIS	1	0.4%	0	0.0%
CORNEA				
70.730 CORNEAL ENDOTHELIAL DEGENERATION	0	0.0%	1	0.6%
UVEA				
93.120 IRIS CYST	1	0.4%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	17	6.7%	2	1.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	2.0%	11	6.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.8%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	10	3.9%	6	3.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.4%	3	1.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	3	1.2%	1	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.8%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.8%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	3	1.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	2	0.8%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.4%	4	2.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	2	0.8%	1	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	4	1.6%	1	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.4%	1	0.6%
100.317 INCIPIENT CATARACT, CAPSULAR	4	1.6%	1	0.6%
100.328 Y-SUTURE TIP OPACITIES	2	0.8%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***25***	***9.8%***	***12***	***7.1%***
VITREOUS				
110.135 PHPV/ PTVL	3	1.2%	1	0.6%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	1.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	4	1.6%	1	0.6%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	0.8%	0	0.0%
120.960 RETINOPATHY	1	0.4%	0	0.0%
FUNDUS				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.6%
OTHER				
900.000 OTHER, UNSPECIFIED	6	2.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	1.6%	8	4.7%
NORMAL				
.000 NORMAL GLOBE	210	82.4%	140	82.8%

MAREMMA SHEEPDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
C.	Chronic superficial keratitis/pannus	Not defined	1	NO
D.	Cataract	Not defined	1	NO
E.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans. This has been reported in the Italian population of the breed.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. This has been reported in the Italian population of the breed.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined. This has been reported in the Italian population of the breed.

References

1. Guandalini A, Di Girolamo N, Santillo D, Andreani V, Corvi R, Bandini M, and Peruccio C. (2017) Epidemiology of ocular disorders presumed to be inherited in three large Italian dog breeds in Italy. *Vet Ophthalmol*, 20: 420-426. doi:10.1111/vop.12442. **This single reference is from non-USA dog population. **

OCULAR DISORDERS REPORT
MAREMMA SHEEPDOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	27		10	
	Diagnostic Name	**#**	**%**	**#**	**%**
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	7.4%	1	10.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	11.1%	0	0.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	3.7%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	1	3.7%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	10.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***2***	***7.4%***	***0***	***0.0%***
VITREOUS					
110.320	VITREOUS DEGENERATION SYNERESIS	1	3.7%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	1	3.7%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	10.0%
NORMAL					
.000	NORMAL GLOBE	21	77.8%	8	80.0%

MARKIESJE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1	NO	Mutation of the *prcd* gene

Description and Comments

A. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Markiesje is *prcd*, which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Markiesje breed. The condition listed above is currently noted solely due to the availability of a genetic test for the disease. **Genetic test available; no references**

OCULAR DISORDERS REPORT
MARKIESJE

There are no statistics available for this breed

MASTIFF

(English)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Ectropion	Not defined	1	Breeder option	
C.	Distichiasis	Not defined	1	Breeder option	
D.	Uveal cysts	Not defined	1	Breeder option	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to cornea	Not defined	1	NO	
	- endothelial opacity/no strands	Not defined	1	NO	
F.	Cataract	Not defined	1	NO	
G.	Retinal atrophy *(RHO)*	Autosomal dominant	1, 2, 3	NO	Mutation of the *RHO* gene
H.	Multifocal retinopathy - *cmr1*	Autosomal recessive	4	NO (Breeder option with Normal DNA test for CMR)	Mutation of the *BEST1* gene
I.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Entropion in the Mastiff is severe and may require multiple surgical corrections.

B. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures

which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Mastiff, the strands often bridge from the iris to the cornea and may potentially cause vision impairment. Thus, the strong recommendations against breeding animals with any form of this abnormality.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal atrophy - *RHO*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. The ERG is normal at 3-6 months of age, but abnormal by 13 months of age. Increased exposure to bright light causes more rapid loss of neurons. PRA in the Mastiff is inherited as an autosomal dominant trait. The mutation is a single nucleotide transversion of the *RHO* gene. A DNA test is available.

H. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Kijas JW, Miller BJ, Pearce-Kelling SE, et al. Canine models of ocular disease: outcross breedings define a dominant disorder present in the English mastiff and bull mastiff dog breeds. *J Hered*. 2003;94:27-30.

3. Miyadera K, Acland GM, Aguirre GD. Genetic and phenotypic variations of inherited retinal diseases in dogs: the power of within- and across-breed studies. *Mamm Genome*. 2012;23:40-61.

4. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007;48:1959-1967.

OCULAR DISORDERS REPORT
MASTIFF

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	9,196		750	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	22	0.2%	0	0.0%
10.000	GLAUCOMA	2	0.0%	0	0.0%
EYELIDS					
20.160	MACROPALPEBRAL FISSURE	344	3.7%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	401	4.4%	76	10.1%
22.000	ECTROPION, UNSPECIFIED	652	7.1%	64	8.5%
25.110	DISTICHIASIS	93	1.0%	5	0.7%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	4	0.0%	3	0.4%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	12	0.1%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	19	0.2%	2	0.3%
CORNEA					
70.210	PANNUS	3	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	4	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	39	0.4%	2	0.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	51	0.6%	2	0.3%
UVEA					
90.250	PIGMENTARY UVEITIS	1	0.0%	0	0.0%
93.120	IRIS CYST	88	1.0%	9	1.2%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	7	0.1%	0	0.0%
93.150	IRIS COLOBOMA	3	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	10	0.1%	4	0.5%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	285	3.1%	30	4.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	61	0.7%	3	0.4%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	468	5.1%	20	2.7%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	19	0.2%	1	0.1%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	8	0.1%	3	0.4%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	51	0.6%	10	1.3%
93.810	UVEAL MELANOMA	3	0.0%	0	0.0%
95.120	CILIARY BODY CYST	4	0.0%	2	0.3%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	23	3.1%
LENS					
100.200	CATARACT, UNSPECIFIED	19	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	423	4.6%	28	3.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	99	1.1%	22	2.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	16	0.2%	3	0.4%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	8	0.1%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	15	0.2%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	16	0.2%	2	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	20	0.2%	6	0.8%
100.307	PUNCTATE CATARACT, CAPSULAR	23	0.3%	7	0.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	77	0.8%	4	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	43	0.5%	2	0.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	23	0.3%	3	0.4%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	8	0.1%	1	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	6	0.1%	2	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	41	0.4%	10	1.3%
100.317	INCIPIENT CATARACT, CAPSULAR	11	0.1%	4	0.5%

OCULAR DISORDERS REPORT
MASTIFF

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 9,196 #	 %	Year Examined: 2018-2022 Total # Dogs: 750 #	 %
LENS Continued				
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	3	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	2	0.3%
100.326 INCOMPLETE CATARACT, NUCLEUS	3	0.0%	1	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	2	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	7	0.1%	3	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT	40	0.4%	1	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	5	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***475***	***5.2%***	***73***	***9.7%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	9	0.1%	2	0.3%
110.135 PHPV/ PTVL	5	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	10	0.1%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	668	7.3%	21	2.8%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	51	0.6%	2	0.3%
120.190 RETINAL DYSPLASIA, DETACHED	5	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	151	1.6%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	4	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	9	0.1%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	4	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	2	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	4	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	59	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED	169	1.8%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	107	1.2%	32	4.3%
NORMAL				
.000 NORMAL GLOBE	6,262	68.1%	469	62.5%

MC NAB

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the MC NAB breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
MC NAB

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	0		9	
Diagnostic Name	**#**	**%**	**#**	**%**
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0		1	11.1%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	0		1	11.1%
NORMAL				
.000 NORMAL GLOBE	0		8	88.9%

MI-KI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
	- anterior chamber	Not defined	1	Breeder option	
E.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1, 2	NO	Mutation in the *prcd* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make strong recommendations with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Mi-Ki is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
MI-KI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,587 #	 %	Year Examined: 2018-2022 Total # Dogs: 256 #	 %
EYELIDS				
20.140 ECTOPIC CILIA	1	0.1%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	2	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	11	0.7%	0	0.0%
25.110 DISTICHIASIS	223	14.1%	35	13.7%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	4	0.3%	0	0.0%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	3	0.2%	1	0.4%
CORNEA				
70.210 PANNUS	1	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS	3	0.2%	3	1.2%
70.700 CORNEAL DYSTROPHY	27	1.7%	1	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	185	11.7%	16	6.3%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	0.2%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.1%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	1	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	133	8.4%	10	3.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	10	0.6%	1	0.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	8	0.5%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	51	3.2%	3	1.2%
100.306 PUNCTATE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	2	0.1%	1	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	5	0.3%	3	1.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	7	0.4%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	13	0.8%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	23	1.4%	3	1.2%
100.316 INCIPIENT CATARACT, NUCLEUS	4	0.3%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	13	0.8%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***132***	***8.3%***	***11***	***4.3%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	2	0.8%
110.135 PHPV/ PTVL	1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	40	2.5%	3	1.2%
110.320 VITREOUS DEGENERATION SYNERESIS	105	6.6%	9	3.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	13	0.8%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	9	0.6%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	7	0.4%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.1%	0	0.0%
120.960 RETINOPATHY	12	0.8%	0	0.0%

OCULAR DISORDERS REPORT
MI-KI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,587 #	 %	Year Examined: 2018-2022 Total # Dogs: 256 #	 %
OPTIC NERVE				
130.110 MICROPAPILLA	2	0.1%	1	0.4%
130.120 OPTIC NERVE HYPOPLASIA	2	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	2	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	24	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED	57	3.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	48	3.0%	19	7.4%
NORMAL				
.000 NORMAL GLOBE	1,003	63.2%	176	68.8%

MINIATURE AMERICAN SHEPHERD (AKC)/MINIATURE AUSTRALIAN SHEPHERD

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris coloboma.

**Due to the breed's ancestry, most of the references cited here are for the Australian Shepherd. The examiner may also find the Australian Shepherd page as a helpful reference for other conditions that may occur but are not yet reported in the Miniature American Shepherd/Miniature Australian Shepherd.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia with multiple ocular defects	Presumed autosomal recessive with incomplete penetrance	2-6	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Iris Coloboma	Not defined	1	NO	
E.	Iris hypoplasia	Not defined	1	Breeder option	
F.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
G.	Cataract				
	- *HSF4*	Autosomal co-dominant	1, 7, 8	NO	Mutation of the *HSF4* gene
H.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- (*prcd*)	Autosomal recessive	1, 9	NO	Mutation of the *prcd* gene
I.	Cone degeneration - day blindness	Autosomal recessive		NO	Mutation of the *CNGB3* gene

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
J.	Multifocal retinopathy - *cmr1*	Autosomal recessive	10, 11	NO (Breeder option with Normal DNA test for CMR)	Mutation of the *BEST1* gene
K.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/coloboma	Autosomal recessive	1, 12-14	NO	Mutation of the *NHEJ1* gene
L.	Coloboma/staphyloma without microphthalmia	Not defined	1	NO	

Description and Comments

A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye with associated defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (dysplasia). In the Australian Shepherd, microphthalmia has long been suspected to be associated with merled coat coloration but a definitive genetic relationship has not been established. The eyes of affected homozygous merle (usually white) dogs have extreme forms of this entity and are usually blind at birth. Affected heterozygous merle-coated dogs demonstrate less severe manifestations.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Iris coloboma

A congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of the closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded ad iris hypoplasia on the eye certification form.

E. Iris hypoplasia

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the eye certification form.

F. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Australian Shepherd, a mutation in *HSF4* (heat shock transcription factor 4), the HSF4-2 mutation, has been shown to increase the likelihood of cataract formation. The mutation is inherited in a co-dominant manner. Dogs with one copy of the mutation develop bilateral posterior cataracts and homozygotes develop a nuclear cataract that typically progresses to a mature cataract. A DNA test is available for this mutation. Other genetic factors can contribute to cataract formation in this breed and will not be detected by this test.

H. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Unpublished data from genetics laboratories has shown that the principal form of PRA in the Australian Shepherd is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

I. Cone degeneration - day blindness or hemeralopia

Autosomal recessively inherited early degeneration of the cone photoreceptors. Affected puppies develop day blindness, color blindness, and photophobia between 8 and 12 weeks of age. Affected dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. Genetically, the condition results from a mutation in the *CNGB3* gene. A DNA test is available.

J. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These

lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression in the initial serous lesions after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs initially exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas, though the retina will continue to degenerate over time thus eventually causing vision impairment.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, Mastiff, Australian Shepherd and other breeds.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

K. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

L. Coloboma/staphyloma (unassociated with microphthalmia)

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin. Scleral ectasia is defined as a congenital thinning and secondary distention of the sclera; when lined by uveal tissue it is called a staphyloma. These may be anteriorly located, apparent as a bulge beneath the upper eyelid or posteriorly located, requiring visualization with an ophthalmoscope. These conditions may or may not be genetically related to the same anomalies seen associated with microphthalmia (entity "A" above).

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gelatt KN, McGill LD. Clinical characteristics of microphthalmia with colobomas of the Australian Shepherd Dog. *J Am Vet Med Assoc*. 1973;162:393-396.

3. Gelatt KN, Veith LA. Hereditary multiple ocular anomalies in Australian Shepherd dogs. *Vet Med Small Anim Clin*. 1970;65:39-42.

4. Cook CS, Burling K, Nelson EJ. Embryogenesis of posterior segment colobomas in the Australian Shepherd dog. *Prog in Vet Comp Ophthalmol*. 1991;1:163-170.

5. Bertram T, Coiqnoul F, Cheville N. Ocular dysgenesis in Australian Shepherd dogs. *J Am Anim Hosp Assoc*. 1984;20:177-182.

6. Gelatt KN, Powell NG, Huston K. Inheritance of microphthalmia with coloboma in the Australian Shepherd dog. *Am J Vet Res*. 1981;42:1686-1690.

7. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol*. 2006;9:369-378.

8. Mellersh CS, McLaughlin B, Ahonen S, et al. Mutation in HSF4 is associated with hereditary cataract in the Australian Shepherd. *Vet Ophthalmol*. 2009;12:372-378.

9. Personal communication on data from Optigen with Sue Pearce-Kelling

10. Hoffman I, Guziewicz KE, Zangler B, et al. Canine multifocal retinopathy in the Australian Shepherd: a case report. *Vet Ophthalmol*. 2012;15:134-138.

11. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650; PMCID: PMC4985128.

12. Rubin LF, Nelson EJ, Sharp CA. Collie eye anomaly in Australian Shepherd dogs. *Prog in Vet Comp Ophthalmol*. 1991;1:105-108.

13. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for Collie eye anomaly. *Genomics*. 2003;82:86-95.

14. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome research*. 2007;17:1562-1571.

15. Munyard KA, Sherry CR, Sherry L. A retrospective evaluation of congenital ocular defects in Australian Shepherd dogs in Australia. *Vet Ophthalmol*. 2007;10:19-22. **reference derived from non-USA dog population**

OCULAR DISORDERS REPORT
MINIATURE AMERICAN(AKC)/MINIATURE AUSTRALIAN SHEPHERD

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	15,561		6,487	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	24	0.2%	5	0.1%
10.000	GLAUCOMA	1	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	0	0.0%	1	0.0%
25.110	DISTICHIASIS	695	4.5%	206	3.2%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.0%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.0%	2	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	2	0.0%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	2	0.0%	1	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	0	0.0%	1	0.0%
CORNEA					
70.220	PIGMENTARY KERATITIS	2	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	142	0.9%	81	1.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	5	0.0%	2	0.0%
UVEA					
90.250	PIGMENTARY UVEITIS	1	0.0%	0	0.0%
93.110	IRIS HYPOPLASIA	83	0.5%	102	1.6%
93.120	IRIS CYST	0	0.0%	2	0.0%
93.150	IRIS COLOBOMA	303	1.9%	119	1.8%
93.180	IIRIS SPHINCTER DYSPLASIA	9	0.1%	9	0.1%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1,499	9.6%	810	12.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	24	0.2%	13	0.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	7	0.0%	2	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	9	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.0%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.0%	0	0.0%
93.810	UVEAL MELANOMA	1	0.0%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	6	0.0%	2	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	27	0.2%	17	0.3%
97.120	COLOBOMA	8	0.1%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	8	0.1%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
130.110	MICROPAPILLA	0	0.0%	7	0.1%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	2	0.0%
130.150	OPTIC DISC COLOBOMA	0	0.0%	5	0.1%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	180	1.2%	86	1.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	30	0.2%	38	0.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	14	0.1%	7	0.1%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	8	0.1%	9	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	6	0.0%	1	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	35	0.2%	9	0.1%
100.306	PUNCTATE CATARACT, NUCLEUS	12	0.1%	21	0.3%
100.307	PUNCTATE CATARACT, CAPSULAR	17	0.1%	13	0.2%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	30	0.2%	17	0.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	31	0.2%	4	0.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	8	0.1%	9	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.0%	0	0.0%

OCULAR DISORDERS REPORT
MINIATURE AMERICAN(AKC)/MINIATURE AUSTRALIAN SHEPHERD

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	15,561		6,487	
	Diagnostic Name	**#**	**%**	**#**	**%**
LENS Continued					
100.316	INCIPIENT CATARACT, NUCLEUS	7	0.0%	2	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	6	0.0%	14	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	2	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.0%	2	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	3	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	1	0.0%
100.328	Y-SUTURE TIP OPACITIES	13	0.1%	25	0.4%
100.330	GENERALIZED/ COMPLETE CATARACT	6	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***218***	***1.4%***	***153***	***2.4%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	61	0.4%	69	1.1%
110.135	PHPV/ PTVL	15	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	14	0.1%	12	0.2%
110.320	VITREOUS DEGENERATION SYNERESIS	63	0.4%	19	0.3%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	50	0.3%	9	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.0%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	28	0.2%	1	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	4	0.0%	1	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	75	0.5%	4	0.1%
130.120	OPTIC NERVE HYPOPLASIA	20	0.1%	4	0.1%
130.150	OPTIC DISC COLOBOMA	26	0.2%	5	0.1%
OTHER					
900.000	OTHER, UNSPECIFIED	129	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	184	1.2%	5	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	139	0.9%	181	2.8%
NORMAL					
.000	NORMAL GLOBE	12,987	83.5%	4,931	76.0%

MINIATURE BULL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to lens	Not defined	1	NO	
	- iris to cornea	Not defined	1	NO	
B.	Cataract	Not defined	1	NO	
C.	Lens luxation	Autosomal recessive	2-4	NO	Mutation of the *ADAMTS17* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Although the total number of Miniature Bull Terriers presented for OFA/CERF examination is not large, the incidence of PPM in this breed is approximately 10% in recent years. Some of these PPM's have been iris to cornea and iris to lens. Considerable discretion should be used before breeding a dog with the latter more severe forms of PPM.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

Two loci with potentially enhancing effects on the ADAMTS17 mutation are associated with primary lens luxation (PLL) in Australian Miniature Bull Terriers. PLL associated allele of the BICF2G630420272 SNP

increases the risk of PLL in the presence of the ADAMTS17 mutation. Candidate genes in the two regions of interest included CPE on chromosome 15 and CTCF on chromosome 1. The ADAMTS17 mutation is also associated with abnormal foot and nail shapes, pedal hyperkeratosis, and persistent pupillary membranes. Association of the ADAMTS17 mutation with possible pedal skeletal abnormalities in the Miniature Bull Terriers supports primary lens luxation in this breed and Marchesani syndrome-like disease in humans as being homologous diseases.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Komaromy A. Genetics of canine primary glaucomas. Vet Clin Small Anim. 2015; 45: 1159-1182.

3. Gharanhkhani P, O'Leary CA, Duffy DL, Kyaw-Tanner M. Potential modifying loci associated with primary lens luxation, pedal hyperkeratosis, and ocular phenotypes in Miniature Bull Terriers. Invest. Ophthalmol. Vis. Sci. 2015; 56(13):8288-8296. doi:10.1167/iovs.15-18074.

4. Gould D, Pettitt L, McLaughlin B, Holmes N, Forman O, Thomas A, Ahonen S, Lohi H, O'Leary C, Sargan D, Mellersh C. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. Vet Ophthalmol. 2011 Nov;14(6):378-84. doi: 10.1111/j.1463-5224.2011.00892.x. Epub 2011 Aug 3. PMID: 22050825.

OCULAR DISORDERS REPORT
MINIATURE BULL TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,283		91	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	3	0.2%	1	1.1%
10.000	GLAUCOMA	1	0.1%	0	0.0%
EYELIDS					
22.000	ECTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110	DISTICHIASIS	1	0.1%	0	0.0%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	6	0.5%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	5	0.4%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	13	1.0%	0	0.0%
UVEA					
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	4	0.3%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	80	6.2%	0	0.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	52	4.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	82	6.4%	1	1.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	8	0.6%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	8	0.6%	3	3.3%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	14	1.1%	3	3.3%
LENS					
100.200	CATARACT, UNSPECIFIED	2	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	54	4.2%	4	4.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	16	1.2%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.2%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.2%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.1%	1	1.1%
100.306	PUNCTATE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	8	0.6%	1	1.1%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	15	1.2%	1	1.1%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	5	0.4%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.1%	1	1.1%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	12	0.9%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	4	0.3%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	51	4.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***70***	***5.5%***	***4***	***4.4%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.3%	1	1.1%
110.320	VITREOUS DEGENERATION SYNERESIS	20	1.6%	1	1.1%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	3	0.2%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	13	1.0%	0	0.0%
120.960	RETINOPATHY	2	0.2%	0	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	12	0.9%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	3	0.2%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
MINIATURE BULL TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,283 #	 %	Year Examined: 2018-2022 Total # Dogs: 91 #	 %
OTHER				
900.000 OTHER, UNSPECIFIED	9	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	33	2.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	23	1.8%	1	1.1%
NORMAL				
.000 NORMAL GLOBE	953	74.3%	79	86.8%

MINIATURE PINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATION DESCRIBED
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Autosomal recessive	1, 2	NO	Mutation in the *HS4-1* gene

Description and Comments

A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The condition is inherited as an autosomal recessive mutation in the HSF4 gene (*HSF4-1*). A DNA test is available.

D. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
MINIATURE PINSCHER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	855		289	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	3	0.4%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.1%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	3	0.4%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110	DISTICHIASIS	5	0.6%	1	0.3%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.1%	0	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.2%	0	0.0%
CORNEA					
70.210	PANNUS	2	0.2%	0	0.0%
70.220	PIGMENTARY KERATITIS	4	0.5%	2	0.7%
70.700	CORNEAL DYSTROPHY	47	5.5%	12	4.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.2%	0	0.0%
UVEA					
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	26	3.0%	6	2.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	10	1.2%	5	1.7%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.2%	2	0.7%
FUNDUS					
97.120	COLOBOMA	1	0.1%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	32	3.7%	6	2.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	7	0.8%	4	1.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	5	0.6%	1	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.2%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.4%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.2%	2	0.7%
100.307	PUNCTATE CATARACT, CAPSULAR	2	0.2%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	22	2.6%	6	2.1%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	11	1.3%	1	0.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	3	0.4%	1	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.2%	4	1.4%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	3	1.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.1%	1	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	7	0.8%	1	0.3%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.3%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.4%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***71***	***8.3%***	***27***	***9.3%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	5	0.6%	0	0.0%
110.135	PHPV/ PTVL	2	0.2%	0	0.0%

OCULAR DISORDERS REPORT
MINIATURE PINSCHER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 855 #	 %	2018-2022 289 #	 %
VITREOUS Continued				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	10	1.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	36	4.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	3	0.4%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	12	1.4%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.4%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	2	0.2%	1	0.3%
130.120 OPTIC NERVE HYPOPLASIA	9	1.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	12	1.4%	0	0.0%
900.100 OTHER, NOT INHERITED	26	3.0%	1	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	18	2.1%	19	6.6%
NORMAL				
.000 NORMAL GLOBE	635	74.3%	228	78.9%

MINIATURE SCHNAUZER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia with congenital cataract	Autosomal recessive	1-4, 16	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Autosomal recessive	1, 5-8, 16	NO	
E.	Retinal dysplasia with Persistent hyperplastic primary vitreous (PHPV)	Autosomal recessive	11	NO	
F	Retinal atrophy				
	- Type A	X-linked	1, 9, 10, 12	NO	
	- *PPT1*	Autosomal recessive	13	NO	Mutation in the gene *PPT1*
G.	Ceroid lipofuscinosis	Presumed autosomal recessive	14, 15	NO	

Description and Comments

A. Microphthalmia with congenital cataract

Congenital nuclear and posterior cortical lens opacities that progress slowly. In some cases, these cataracts appear similar to the congenital cataracts described in "E" below. An associated abnormality in this defect is microphthalmia that is often mild and is accompanied by a 1-3 mm reduction in the axial length of the globe as determined by ultrasonography. The cataracts often do not become mature and cause blindness until the dogs reach 3-5 years of age. Congenital cataracts and microphthalmia are inherited as an autosomal recessive disorder.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Congenital cataracts in the Miniature Schnauzer are bilateral and appear prior to 6 weeks of age. At this time they may already involve the entire lens. Others will first appear as posterior subcapsular opacities and usually progress to complete cataracts. These congenital cataracts are inherited as an autosomal recessive trait. Later-onset cataracts may represent a genetically distinct entity. There are other types of cataract in the breed which are also likely hereditary.

Note: It is not certain whether A and F are genetically distinct, or different manifestations of the same entity, as eyes affected with cataracts are often smaller than normal.

E. Retinal dysplasia with persistent hyperplastic primary vitreous (PHPV)

In the Miniature Schnauzer PHPV is associated with retinal dysplasia in some dogs. In this association it may be unilateral or bilateral and most often manifests as small white posterior lens capsule plaques accompanied by white primary vitreous mass extending to the optic disc. Patent hyaloid arteries and posterior lens capsule vessels may also be present.

F. Retinal atrophy

- Type A

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most forms of PRA are inherited as recessive traits.

A form of PRA in the Miniature Schnauzer was previously characterized and called photoreceptor dysplasia (now called Type A PRA, known to be X-linked in terms of inheritance). The dysplasia results from the abnormal development of visual cells followed by their degeneration. The disorder appears to affect the generation of an electrical signal within the retinal photoreceptor cells. Although fundus abnormalities usually are not present until 2-3 years of age, abnormalities of the electroretinogram can be demonstrated by 8-10 weeks of age. Clinical signs include mildly impaired night vision and variable rate of progression.

Initial studies suggested a mutation in phosducin was responsible, but this was disproven. This disease is extremely rare. The causative gene for Type A PRA has not been published although a DNA test is available. Another more common autosomal recessive form of PRA appears to be present in the Miniature Schnauzer,

but the causative gene has not yet been determined; it also affects dogs ~2-4 years of age. Lastly, cases of late-onset PRA in the breed are recognized clinically but the inheritance pattern is unknown. (G. Aguirre personal communication 2016).

- PPT-1

PPT1 (*HIVP3*) mutations have been identified to segregate with PRA in Miniature Schnauzers. Age of onset is variable, and more than one variant may be causative. Penetrance of the mutation may be incomplete so care should be taken in interpretation of genetic testing results.

G. Ceroid lipofuscinosis

An inherited disease of man and animals characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's disease). This disease is very rare.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gelatt KN, Samuelson DA, Barrie KP, et al. Biometry and clinical characteristics of congenital cataracts and microphthalmia in the Miniature Schnauzer. *J Am Vet Med Assoc*. 1983;183:99-102.
3. Gelatt KN, Samuelson DA, Bauer JE, et al. Inheritance of congenital cataracts and microphthalmia in the Miniature Schnauzer. *Am J Vet Res*. 1983;44:1130-1132.
4. Shastry BS, Reddy VN. Studies on congenital hereditary cataract and microphthalmia of the Miniature Schnauzer dog. *Biochem Biophys Res Commun*. 1994;203:1663-1667.
5. Samuelson DA. Prenatal morphogenesis of the congenital cataracts in the Miniature Schnauzer. *Lens Res*. 1987;4:231-250.
6. Rubin LF, Koch SA, Huber RJ. Hereditary cataracts in Miniature Schnauzers. *J Am Vet Med Assoc*. 1969;154:1456-1458.
7. Barnett KC. Hereditary cataracts in the Miniature Schnauzer. *J Small Anim Pract*. 1985;26:635-644.
8. Monaco MA, Samuelson DA, Gelatt KN. Morphology and postnatal development of the normal lens in the dog and congenital cataract in the Miniature Schnauzer. *Lens Res*. 1985;2:393-400.
9. Zhang Q, Acland GM, Parshall CJ, et al. Characterization of canine photoreceptor phosducin cDNA and identification of a sequence variant in dogs with photoreceptor dysplasia. *Gene*. 1998;215:231-239.
10. Parshall C, Wyman M, Nitroy S. Photoreceptor dysplasia: An inherited progressive retinal atrophy of Miniature Schnauzer dogs. *Prog Vet Comp Ophthal*. 1991;1:187-191.
11. Grahn BH, Storey ES, McMillan C. Inherited retinal dysplasia and persistent hyperplastic primary vitreous in Miniature Schnauzer dogs. *Vet Ophthalmol*. 2004;7:151-158.

Commented [1]: needs to be removed, and references renumbered

12. Kaukonen M, Quintero IB, Mukarram AK, Hytönen MK, Holopainen S, Wickström K, Kyöstilä K, Arumilli M, Jalomäki S, Daub CO, Kere J, Lohi H; DoGA Consortium. A putative silencer variant in a spontaneous canine model of retinitis pigmentosa. PLoS Genet. 2020 Mar 9;16(3):e1008659. doi: 10.1371/journal.pgen.1008659. PMID: 32150541; PMCID: PMC7082071.

13. Murgiano L, Becker D, Torjman D, Niggel JK, Milano A, Cullen C, Feng R, Wang F, Jagannathan V, Pearce-Kelling S, Katz ML, Leeb T, Aguirre GD. Complex Structural *PPT1* Variant Associated with Non-syndromic Canine Retinal Degeneration. G3 (Bethesda). 2019 Feb 7;9(2):425-437. doi: 10.1534/g3.118.200859. PMID: 30541930; PMCID: PMC6385984.

14. Jolly RD, Palmer DN, Studdert VP. Canine ceroid-lipofuscinoses: A review and classification. *J Small Anim Pract*. 1994;35:299-306.

15. Smith RIE, Sutton RH, Jolly RD. A retinal degeneration associated with ceroid-lipofuscinosis in adult Miniature Schanuzer. *Vet Comp Ophthalmol*. 1996;6:187-191.

16. Zhang RL, Samuelson DA, Zhang ZG, Reddy VN, Shastry BS. Analysis of eye lens-specific genes in congenital hereditary cataracts and microphthalmia of the miniature schnauzer dog. Invest Ophthalmol Vis Sci. 1991 Aug;32(9):2662-5. PMID: 1869417.

OCULAR DISORDERS REPORT
MINIATURE SCHNAUZER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 31,228 #	 %	2018-2022 5,786 #	 %
GLOBE				
.110 MICROPHTHALMIA	23	0.1%	2	0.0%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	5	0.0%	9	0.2%
25.110 DISTICHIASIS	638	2.0%	106	1.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	3	0.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.0%	1	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	6	0.0%	2	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	4	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	3	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	7	0.0%	5	0.1%
70.700 CORNEAL DYSTROPHY	158	0.5%	20	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	17	0.1%	1	0.0%
UVEA				
90.250 PIGMENTARY UVEITIS	2	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA	1	0.0%	1	0.0%
93.120 IRIS CYST	1	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	10	0.0%	0	0.0%
93.150 IRIS COLOBOMA	1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	0	0.0%	1	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	518	1.7%	76	1.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	50	0.2%	3	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	81	0.3%	7	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	12	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	111	0.4%	74	1.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	13	0.0%	2	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	4	0.0%	1	0.0%
97.120 COLOBOMA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.0%
120.960 RETINOPATHY	0	0.0%	1	0.0%
130.110 MICROPAPILLA	0	0.0%	2	0.0%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	61	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	642	2.1%	109	1.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	155	0.5%	34	0.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	62	0.2%	14	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	55	0.2%	5	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	17	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	91	0.3%	28	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS	21	0.1%	9	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR	51	0.2%	21	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	118	0.4%	27	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	149	0.5%	25	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	70	0.2%	17	0.3%

OCULAR DISORDERS REPORT
MINIATURE SCHNAUZER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 31,228 #	 %	2018-2022 5,786 #	 %
LENS Continued				
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	9	0.0%	3	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	38	0.1%	3	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	29	0.1%	17	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR	30	0.1%	13	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	12	0.0%	10	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	18	0.1%	11	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	3	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	2	0.0%	3	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	19	0.1%	12	0.2%
100.327 INCOMPLETE CATARACT, CAPSULAR	2	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	23	0.1%	17	0.3%
100.330 GENERALIZED/ COMPLETE CATARACT	152	0.5%	5	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	2	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	7	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,163***	***3.7%***	***262***	***4.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	44	0.1%	17	0.3%
110.135 PHPV/ PTVL	24	0.1%	1	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	47	0.2%	6	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	141	0.5%	13	0.2%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	68	0.2%	2	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	49	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	32	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	151	0.5%	3	0.1%
120.400 RETINAL HEMORRHAGE	6	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	14	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	0	0.0%
120.960 RETINOPATHY	6	0.0%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	49	0.2%	10	0.2%
130.120 OPTIC NERVE HYPOPLASIA	16	0.1%	1	0.0%
130.150 OPTIC DISC COLOBOMA	2	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	158	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED	341	1.1%	1	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	208	0.7%	127	2.2%
NORMAL				
.000 NORMAL GLOBE	28,402	91.0%	5,161	89.2%

MUDI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

Any opacity of the lens and/or its capsule, regardless of size or location within the lens. Cataracts are assumed to be hereditary unless associated with known trauma, ocular inflammation, specific metabolic diseases, or nutritional deficiencies.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
MUDI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 108 #	 %	2018-2022 254 #	 %
EYELIDS				
25.110 DISTICHIASIS	2	1.9%	1	0.4%
CORNEA				
70.220 PIGMENTARY KERATITIS	0	0.0%	1	0.4%
70.700 CORNEAL DYSTROPHY	0	0.0%	2	0.8%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	10	9.3%	18	7.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	0.4%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	3.7%	6	2.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.9%	7	2.8%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	5	4.6%	4	1.6%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.9%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES	4	3.7%	2	0.8%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***7***	***6.5%***	***15***	***5.9%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	1	0.4%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.4%
OTHER				
900.000 OTHER, UNSPECIFIED	1	0.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	3.7%	19	7.5%
NORMAL				
.000 NORMAL GLOBE	88	81.5%	205	80.7%

MUNSTERLANDER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the MUNSTERLANDER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
MUNSTERLANDER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		1	
Diagnostic Name		**#**	**%**	**#**	**%**
NORMAL					
.000	NORMAL GLOBE	1	100.0%	1	100.0%

NATIVE AMERICAN INDIAN DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the NATIVE AMERICAN INDIAN DOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
NATIVE AM. INDIAN DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1 #	 %	2018-2022 1 #	 %
LENS				
100.326 INCOMPLETE CATARACT, NUCLEUS	1	100.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***100.0%***	***0***	***0.0%***
NORMAL				
.000 NORMAL GLOBE	0	0.0%	1	100.0%

NATIVE AMERICAN VILLAGE DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the NATIVE AMERICAN VILLAGE DOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
NATIVE AM. VILLAGE DOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2		1	
	Diagnostic Name	**#**	**%**	**#**	**%**
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	50.0%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	1	50.0%	1	100.0%

NEAPOLITAN MASTIFF

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1,2	Breeder option
B.	Ectropion	Not defined	1	Breeder option

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Guandalini A, Di Girolamo N, Santillo D, Andreani V, Corvi R, Bandini M, Peruccio C. Epidemiology of ocular disorders presumed to be inherited in three large Italian dog breeds in Italy. Vet Ophthalmol. 2017 Sep;20(5):420-426. doi: 10.1111/vop.12442. Epub 2016 Nov 11. PMID: 27860098. **non-USA dog population**

OCULAR DISORDERS REPORT
NEAPOLITAN MASTIFF

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 80 #	 %	2018-2022 43 #	 %
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	14	17.5%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	19	23.8%	16	37.2%
22.000 ECTROPION, UNSPECIFIED	28	35.0%	22	51.2%
25.110 DISTICHIASIS	8	10.0%	3	7.0%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	1	1.3%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	1.3%	2	4.7%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	5	6.3%	6	14.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	3	3.8%	0	0.0%
70.700 CORNEAL DYSTROPHY	1	1.3%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	0	0.0%	1	2.3%
UVEA				
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	1.3%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	1.3%	3	7.0%
100.306 PUNCTATE CATARACT, NUCLEUS	1	1.3%	2	4.7%
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	2.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	1.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	1	1.3%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	3	3.8%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***6***	***7.5%***	***3***	***7.0%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	2.5%	0	0.0%
120.960 RETINOPATHY	1	1.3%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	1.3%	0	0.0%
900.100 OTHER, NOT INHERITED	1	1.3%	1	2.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	6	7.5%	5	11.6%
NORMAL				
.000 NORMAL GLOBE	27	33.8%	9	20.9%

NEDERLANDSE KOOIKERHONDJE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. This has been reported in the Italian population of the breed.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
NEDERLANDSE KOOIKERHONDJE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	125		177	
	Diagnostic Name	**#**	**%**	**#**	**%**
CORNEA					
70.700	CORNEAL DYSTROPHY	0	0.0%	2	1.1%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3	2.4%	2	1.1%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.8%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	0.6%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	9	7.2%	4	2.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.8%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.8%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	2	1.6%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	3	2.4%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	3	2.4%	3	1.7%
100.317	INCIPIENT CATARACT, CAPSULAR	0	0.0%	1	0.6%
100.328	Y-SUTURE TIP OPACITIES	1	0.8%	2	1.1%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***10***	***8.0%***	***5***	***2.8%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.8%	2	1.1%
110.320	VITREOUS DEGENERATION SYNERESIS	2	1.6%	4	2.3%
RETINA					
120.960	RETINOPATHY	1	0.8%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	2	1.6%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	7	5.6%	12	6.8%
NORMAL					
.000	NORMAL GLOBE	105	84.0%	153	86.4%

NEW ZEALAND HUNTAWAY

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the NEW ZEALAND HUNTAWAY breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
NEW ZEALAND HUNTAWAY

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2 #	 %	Year Examined: 2018-2022 Total # Dogs: 0 #	 %
UVEA				
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	50.0%	0	
NORMAL				
.000 NORMAL GLOBE	2	100.0%	0	

NEWFOUNDLAND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2	NO
B.	Entropion	Not defined	1	Breeder option
C.	Ectropion	Not defined	1	Breeder option
D.	Uveal cysts	Not defined	1	Breeder option
E.	Cataract	Not defined	1	NO

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening examination.

Some Newfoundlands have an abnormality of the iridocorneal angle termed goniodysgenesis. This abnormality is not visible during routine ophthalmic examination using a slitlamp biomicroscope and an indirect ophthalmoscope. There appears to be an association between goniodysgenesis and glaucoma, but the mechanism by which the angle defect results in glaucoma has not been determined. The inheritance of goniodysgenesis in the Newfoundland is not known. Until the inheritance is determined, control should be directed towards removing dogs from breeding that have glaucoma and have goniodysgenesis, as well as those dogs that produce progeny afflicted with glaucoma.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

D. Uveal cysts

A pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating

within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions is various breeds.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol*. 2011 Mar;14:121-126. **non-USA dog population**

OCULAR DISORDERS REPORT
NEWFOUNDLAND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,297 #	 %	2018-2022 570 #	 %
GLOBE				
.110 MICROPHTHALMIA	6	0.2%	0	0.0%
10.000 GLAUCOMA	1	0.0%	0	0.0%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	128	3.9%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	224	6.8%	42	7.4%
22.000 ECTROPION, UNSPECIFIED	235	7.1%	12	2.1%
25.110 DISTICHIASIS	21	0.6%	2	0.4%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	15	0.5%	3	0.5%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	10	0.3%	5	0.9%
CORNEA				
70.210 PANNUS	1	0.0%	1	0.2%
70.220 PIGMENTARY KERATITIS	2	0.1%	3	0.5%
70.700 CORNEAL DYSTROPHY	1	0.0%	1	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	0	0.0%	2	0.4%
UVEA				
93.120 IRIS CYST	48	1.5%	10	1.8%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	3	0.1%	3	0.5%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	23	0.7%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	5	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.2%	2	0.4%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.1%	0	0.0%
93.810 UVEAL MELANOMA	1	0.0%	0	0.0%
95.120 CILIARY BODY CYST	4	0.1%	4	0.7%
LENS				
100.200 CATARACT, UNSPECIFIED	11	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	110	3.3%	16	2.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	14	0.4%	5	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	14	0.4%	3	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	8	0.2%	2	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	12	0.4%	1	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS	4	0.1%	1	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR	6	0.2%	5	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	25	0.8%	1	0.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	93	2.8%	13	2.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	22	0.7%	4	0.7%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	14	0.4%	1	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS	14	0.4%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	8	0.2%	3	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	4	0.7%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	5	0.2%	6	1.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	3	0.5%
100.326 INCOMPLETE CATARACT, NUCLEUS	0	0.0%	2	0.4%
100.328 Y-SUTURE TIP OPACITIES	3	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	38	1.2%	5	0.9%

OCULAR DISORDERS REPORT
NEWFOUNDLAND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,297 #	 %	Year Examined: 2018-2022 Total # Dogs: 570 #	 %
LENS Continued				
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***293***	***8.9%***	***60***	***10.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	5	0.2%	1	0.2%
110.135 PHPV/ PTVL	4	0.1%	1	0.2%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	4	0.1%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	28	0.8%	1	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	1	0.0%	0	0.0%
FUNDUS				
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.2%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	7	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	29	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	73	2.2%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	50	1.5%	20	3.5%
NORMAL				
.000 NORMAL GLOBE	2,481	75.3%	440	77.2%

NORFOLK TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
	-endothelial opacity/no strands	Not defined	1	NO	
C.	Cataract	Not defined	1	NO	
D.	Lens luxation	Autosomal recessive	2, 3	NO	Mutation in the *ADAMTS17* gene
E.	Optic nerve hypoplasia	Not defined	1	NO	

Description and Comments

A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in

ADAMTS17 has been associated with primary lens luxation. A DNA test is available.

E. Optic nerve hypoplasia

A congenital anomaly, which results in a small optic disk diameter and vision loss.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011; 14: 378-384.

3. Komaromy A. Genetics of canine primary glaucomas. Vet Clin Small Anim. 2015; 45: 1159-1182.

OCULAR DISORDERS REPORT
NORFOLK TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,450 #	 %	Year Examined: 2018-2022 Total # Dogs: 400 #	 %
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	1	0.1%	0	0.0%
25.110 DISTICHIASIS	6	0.4%	1	0.3%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.3%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	2	0.1%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	14	1.0%	6	1.5%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	2	0.5%
UVEA				
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	311	21.4%	81	20.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	1	0.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	4	0.3%	3	0.8%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	10	0.7%	13	3.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.1%	7	1.8%
FUNDUS				
97.120 COLOBOMA	1	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.3%
130.110 MICROPAPILLA	0	0.0%	1	0.3%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.3%
LENS				
100.200 CATARACT, UNSPECIFIED	1	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	45	3.1%	9	2.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	5	0.3%	2	0.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	5	0.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	8	0.6%	2	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	4	0.3%	2	0.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	7	0.5%	6	1.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	16	1.1%	5	1.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	6	0.4%	5	1.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.1%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR	5	0.3%	1	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	3	0.8%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.1%	2	0.5%
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	1	0.3%
100.330 GENERALIZED/ COMPLETE CATARACT	4	0.3%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***68***	***4.7%***	***30***	***7.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	8	0.6%	1	0.3%
110.135 PHPV/ PTVL	1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	8	0.6%	1	0.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	7	0.5%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	10	0.7%	1	0.3%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
NORFOLK TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,450 #	 %	Year Examined: 2018-2022 Total # Dogs: 400 #	 %
OPTIC NERVE				
130.110 MICROPAPILLA	11	0.8%	3	0.8%
130.120 OPTIC NERVE HYPOPLASIA	18	1.2%	8	2.0%
130.150 OPTIC DISC COLOBOMA	19	1.3%	1	0.3%
OTHER				
900.000 OTHER, UNSPECIFIED	14	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	38	2.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	27	1.9%	13	3.3%
NORMAL				
.000 NORMAL GLOBE	1,034	71.3%	257	64.3%

NORBOTTENSPETS

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1	NO	Mutation of the *prcd* gene

Description and Comments

A. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Norbottenspets is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Correction: Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2019 Jan 18;15(1):e1007938. doi: 10.1371/journal.pgen.1007938. Erratum for: PLoS Genet. 2018 Apr 30;14(4):e1007361. PMID: 30657768; PMCID: PMC6338350.

OCULAR DISORDERS REPORT
NORRBOTTENSPETS

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 112 #	 %	Year Examined: 2018-2022 Total # Dogs: 17 #	 %
EYELIDS				
25.110 DISTICHIASIS	2	1.8%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	0.9%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	7	6.3%	1	5.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.9%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	1.8%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	6	5.4%	1	5.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	1.8%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.9%	1	5.9%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.9%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	7	6.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	9	8.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.9%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	3	2.7%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	1	5.9%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.9%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***25***	***22.3%***	***1***	***5.9%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	1.8%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2	1.8%	0	0.0%
OTHER				
900.100 OTHER, NOT INHERITED	3	2.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.9%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	84	75.0%	15	88.2%

NORTH AMERICAN SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the NORTH AMERICAN SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
NORTH AMERICAN SHEPHERD

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	6		0	
Diagnostic Name		#	%	#	%
VITREOUS					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	16.7%	0	
NORMAL					
.000	NORMAL GLOBE	5	83.3%	0	

NORTHERN INUIT

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal dysplasia - folds/geographic/detached (with skeletal defects)	Autosomal recessive	1, 2	NO	Mutation in the *COL9A3* gene

Description and Comments

A. Retinal dysplasia - folds or detachment with skeletal defects

This condition is also known as oculo-skeletal dysplasia (OSD) or dwarfism with retinal dysplasia type 1 (DRD1)also occurs in the Labrador Retriever. A similar condition, DRD2, occurs in the Samoyed. The condition is autosomal recessive and homozygous affected dogs have shortened forelimbs ("downhill" conformation) with valgus deformity. They have severe ocular defects including cataract, retinal folds/multifocal retinal dysplasia, vitreal degeneration and retinal detachment. The ocular abnormalities result in blindness in most dogs. Heterozygous dogs can have either a normal ocular exam or have multiple retinal folds, vitreal membranes, or vitreal degeneration suggesting a semi-dominant mechanism with respect to the eyes. It is important to note that generally the retinal folds present in heterozygous dogs tend to cluster around the major superior blood vessels of the central tapetal region. The condition is caused by a 1 base pair insertion of *COL9A3.* A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Stavinohova R, Hartley C, Burmeister LM, Ricketts SL, Pettitt L, Tetas Pont R, Hitti RJ, Schofield E, Oliver JAC, Mellersh CS. Clinical, histopathological and genetic characterisation of oculoskeletal dysplasia in the Northern Inuit Dog. PLoS One. 2019 Aug 15;14(8):e0220761. doi: 10.1371/journal.pone.0220761. PMID: 31415586; PMCID: PMC6695176. **Reference (2) from non-USA dog population**

OCULAR DISORDERS REPORT
NORTHERN INUIT

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 6 #	 %	2018-2022 19 #	 %
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	2	10.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	1	5.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	5.3%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***0***	***0.0%***	***2***	***10.5%***
NORMAL				
.000 NORMAL GLOBE	6	100.0%	17	89.5%

NORWEGIAN BUHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract			
	- generalized	Not defined	1, 3	NO
	- pulverulent	Presumed autosomal dominant	2, 3	Breeder option
B.	Y-suture top opacity	Not defined	1	Breeder option

Description and Comments

A. Cataract

- generalized

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

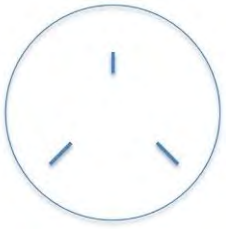
- pulverulent

With the pulverulent cataract in the Norwegian Buhund, initial lens changes may be visible as early as 6.5 weeks of age as small dots parallel to the suture lines behind the nucleus. By the age of 4 to 5.5 years, the opacities progress to involve the fetal nucleus which then resembles a ball of candy floss. The adult nucleus and the cortex remain clear. An autosomal dominant mode of inheritance with a high degree of penetrance has been suggested.

Rates of progression of these cataracts can vary, and have been noted to develop in older animals (over the age of 7) that were previously documented to be free from this condition.

B. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Bjerkas E and Haaland MB. Pulverulent nuclear cataract in the Norwegian Buhund. *J Small Anim Pract.* 1995;36:471-474.

3. Kristiansen E, Revold T, Lingaas F, Narfstrom K, Pedersen PB, Kielland C, Dahl S, Ropstad EO. (2017), Cataracts in the Norwegian Buhund – current prevalence and characteristics. Vet Ophthalmol, 20: 460-467. doi.10.1111/vop.12449.

OCULAR DISORDERS REPORT
NORWEGIAN BUHUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	738		347	
	Diagnostic Name	#	%	#	%
GLOBE					
10.000	GLAUCOMA	1	0.1%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	2	0.3%	1	0.3%
CORNEA					
70.220	PIGMENTARY KERATITIS	0	0.0%	1	0.3%
70.700	CORNEAL DYSTROPHY	7	0.9%	2	0.6%
UVEA					
93.110	IRIS HYPOPLASIA	1	0.1%	0	0.0%
93.120	IRIS CYST	0	0.0%	1	0.3%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2	0.3%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.3%	1	0.3%
93.810	UVEAL MELANOMA	0	0.0%	1	0.3%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	84	11.4%	46	13.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	8	1.1%	9	2.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	11	1.5%	6	1.7%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	1	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.3%	1	0.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	11	1.5%	11	3.2%
100.306	PUNCTATE CATARACT, NUCLEUS	25	3.4%	17	4.9%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.1%	2	0.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	5	0.7%	3	0.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	20	2.7%	10	2.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.3%	1	0.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	10	1.4%	5	1.4%
100.316	INCIPIENT CATARACT, NUCLEUS	16	2.2%	9	2.6%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.3%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	14	1.9%	3	0.9%
100.330	GENERALIZED/ COMPLETE CATARACT	6	0.8%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***121***	***16.4%***	***76***	***21.9%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	0	0.0%	4	1.2%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	8	1.1%	3	0.9%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.4%	0	0.0%
120.960	RETINOPATHY	3	0.4%	5	1.4%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.3%
FUNDUS					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.6%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.6%
120.960	RETINOPATHY	0	0.0%	1	0.3%
OTHER					
900.000	OTHER, UNSPECIFIED	14	1.9%	0	0.0%
900.100	OTHER, NOT INHERITED	18	2.4%	5	1.4%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	21	2.8%	18	5.2%

OCULAR DISORDERS REPORT
NORWEGIAN BUHUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	738		347	
Diagnostic Name		#	%	#	%
NORMAL					
.000	NORMAL GLOBE	544	73.7%	234	67.4%

NORWEGIAN ELKHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Autosomal recessive	1-6	NO	Mutation of the *ADAMS10* gene
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- (*prcd)*	Autosomal recessive	1	NO	Mutation of the *prcd* gene
	- Rod dysplasia (*rd*)**	Autosomal recessive	7-10	NO	
	- Early retinal degeneration (*erd*)**	Autosomal recessive	11-15	NO	Mutation of the *STK38L* gene
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

In the Norwegian Elkhound, glaucoma appears to be familial. In most cases the drainage angle is reported to be open. A mutation has been found in *ADAMTS10* in some Norwegian Elkhounds with glaucoma, but a genetic test is not yet available.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis

should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- *prcd*

Studies have shown that PRA in the Norwegian Elkhound is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

- rod dysplasia (*rd*)**

Inappropriate development of the visual cells resulting in vision impairment in dim light by 6 months and total blindness at 3-5 years. Ophthalmoscopic signs may be evident after 5 months of age, with signs of retinal vascular thinning after 2 years. An ERG can provide a diagnosis as early as 6 weeks of age. In the Norwegian Elkhound, this is an autosomal recessive trait.

- early retinal degeneration (*erd*)**

Another form of PRA reported in the Norwegian Elkhound. Animals are night blind at 6 weeks and blind by 1 year of age. Clinical signs are evident by 6 months. On histopathologic examination there is an abnormal structural development of the photoreceptors followed by rapid rod/cone degeneration. The mutation is found in the *STK38L* gene and is inherited as an autosomal recessive trait. While a DNA test is available, no Norwegian Elkhounds are thought to exist with this mutation anymore.

Although previously described, these diseases do not exist in the current population after being identified in a small number of dogs and described in the literature.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Ekesten B, Bjerkas E, Kongsengen Kea. Primary glaucoma in the Norwegian Elkhound. *Vet Comp Ophthalmol*. 1997;7:14-18.

3. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111.

4. Slater MR, Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc*. 1986;188:1028-1030.

5. Ahonen SJ, Kaukonen M, Nussdorfer FD, et al. A novel missense mutation in ADAMTS10 in Norwegian Elkhound primary glaucoma. *PLoS One*. 2014;9:e111941.

6. Martin CL, Wyman M. Primary glaucoma in the dog. *Vet Clin North Am*. 1978;8:257-286.

7. Cogan DG, Kuwabara T. Photoreceptive Abiotrophy of the Retina in the Elkhound. *Pathol Vet*. 1965;2:101-128.

8. Aguirre GD, Rubin LF. Progressive retinal atrophy (rod dysplasia) in the Norwegian Elkhound. *J Am Vet Med Assoc*. 1971;158:208-218.

9. Aguirre GD, Rubin LF. An electrophysiologic approach for early diagnosis of progressive retinal atrophy in Norwegian Elkhound. *J Am Anim Hosp Assoc*. 1971;7:136-142.

10. Aguirre GD, Rubin LF. The early diagnosis of rod dysplasia in the Norwegian Elkhound. *J Am Vet Med Assoc*. 1971;159:429-433.

11. Acland GM, Aguirre GD. Retinal degenerations in the dog: IV. Early retinal degeneration (erd) in Norwegian Elkhounds. *Exp Eye Res*. 1987;44:491-521.

12. Moghrabi WN, Kedzierski W, Travis GH. Canine homolog and exclusion of retinal degeneration slow (rds) as the gene for early retinal degeneration (erd) in the dog. *Exp Eye Res*. 1995;61:641-643.

13. Ray K, Acland GM, Aguirre GD. Nonallelism of erd and prcd and exclusion of the canine RDS/peripherin gene as a candidate for both retinal degeneration loci. *Invest Ophthalmol Vis Sci*. 1996;37:783-794.

14. Kukekova AV, Aguirre GD, Acland GM. Cloning and characterization of canine SHARP1 and its evaluation as a positional candidate for canine early retinal degeneration (erd). *Gene*. 2003;312:335-343.

15. Goldstein O, Kukekova AV, Aguirre GD, et al. Exonic SINE insertion in STK38L causes canine early retinal degeneration (erd). *Genomics*. 2010;96:362-368.

OCULAR DISORDERS REPORT
NORWEGIAN ELKHOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2,659		202	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	4	0.2%	0	0.0%
10.000	GLAUCOMA	2	0.1%	0	0.0%
EYELIDS					
20.160	MACROPALPEBRAL FISSURE	16	0.6%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	5	0.2%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	14	0.5%	0	0.0%
25.110	DISTICHIASIS	45	1.7%	2	1.0%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.1%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	2	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	10	0.4%	2	1.0%
UVEA					
93.120	IRIS CYST	6	0.2%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	37	1.4%	0	0.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	11	0.4%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.2%	1	0.5%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	4	0.2%	5	2.5%
LENS					
100.200	CATARACT, UNSPECIFIED	23	0.9%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	110	4.1%	19	9.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	10	0.4%	5	2.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	10	0.4%	1	0.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.2%	2	1.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.5%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	13	0.5%	2	1.0%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.2%	6	3.0%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.1%	3	1.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	12	0.5%	1	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	39	1.5%	1	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	24	0.9%	2	1.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	8	0.3%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	10	0.4%	2	1.0%
100.317	INCIPIENT CATARACT, CAPSULAR	9	0.3%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	1	0.5%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.5%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.5%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	4	0.2%	6	3.0%
100.330	GENERALIZED/ COMPLETE CATARACT	7	0.3%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.2%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***185***	***7.0%***	***29***	***14.4%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	7	0.3%	0	0.0%
110.135	PHPV/ PTVL	2	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	8	0.3%	0	0.0%

OCULAR DISORDERS REPORT
NORWEGIAN ELKHOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2,659		202	
	Diagnostic Name	#	%	#	%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	50	1.9%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	10	0.4%	0	0.0%
120.400	RETINAL HEMORRHAGE	3	0.1%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
FUNDUS					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.5%
OPTIC NERVE					
130.110	MICROPAPILLA	0	0.0%	1	0.5%
130.120	OPTIC NERVE HYPOPLASIA	3	0.1%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	22	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	32	1.2%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	21	0.8%	21	10.4%
NORMAL					
.000	NORMAL GLOBE	2,276	85.6%	144	71.3%

NORWEGIAN LUNDEHUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the NORWEGIAN LUNDEHUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
NORWEGIAN LUNDEHUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	50		2	
	Diagnostic Name	#	%	#	%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	13	26.0%	1	50.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	2.0%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	16.0%	0	0.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	2.0%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	2	4.0%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	2	4.0%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	2.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	4.0%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	3	6.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***11***	***22.0%***	***0***	***0.0%***
VITREOUS					
110.320	VITREOUS DEGENERATION SYNERESIS	2	4.0%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	1	2.0%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	31	62.0%	1	50.0%

NORWICH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	2	NO	
D.	Lens luxation	Autosomal recessive	2, 3	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010;51:4716-4721.

3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384.

OCULAR DISORDERS REPORT
NORWICH TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,348 #	 %	2018-2022 567 #	 %
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110 DISTICHIASIS	24	0.7%	9	1.6%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.1%	0	0.0%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	4	0.1%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	19	0.6%	4	0.7%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	4	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	1	0.0%	0	0.0%
93.150 IRIS COLOBOMA	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	186	5.6%	14	2.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	4	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	8	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	0.1%	4	0.7%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.1%	2	0.4%
FUNDUS				
97.120 COLOBOMA	2	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.2%
LENS				
100.200 CATARACT, UNSPECIFIED	5	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	78	2.3%	10	1.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	15	0.4%	4	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	12	0.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	5	0.1%	3	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	9	0.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	4	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	5	0.1%	2	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	19	0.6%	3	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	19	0.6%	5	0.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	13	0.4%	2	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	6	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	14	0.4%	4	0.7%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.0%	4	0.7%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	1	0.0%	3	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT	13	0.4%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***146***	***4.4%***	***28***	***4.9%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	3	0.1%	0	0.0%
110.135 PHPV/ PTVL	1	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	11	0.3%	0	0.0%

OCULAR DISORDERS REPORT
NORWICH TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,348 #	 %	Year Examined: 2018-2022 Total # Dogs: 567 #	 %
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	7	0.2%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	4	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	14	0.4%	0	0.0%
120.960 RETINOPATHY	6	0.2%	1	0.2%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	8	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	3	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	28	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	52	1.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	27	0.8%	10	1.8%
NORMAL				
.000 NORMAL GLOBE	2,978	88.9%	502	88.5%

NOVA SCOTIA DUCK TOLLING RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to lens	Not defined	1	NO	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
F.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- (*prcd)*	Autosomal recessive	1,5	NO	Mutation of the *prcd* gene
G.	Choroidal hypoplasia (Collie eye anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Autosomal recessive	3, 4, 6	NO	Mutation of the *NHEJ1* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

In the Nova Scotia Duck Tolling Retriever, many of the PPMs identified on routine screening examinations bridge from the iris to the lens where they are associated with focal cataract. This may result in vision impairment.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

F. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Studies have shown that the principal form of PRA in the Nova Scotia Duck Tolling Retriever is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

G. Choroidal hypoplasia (Collie eye anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie eye anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res*. 2007 Nov;17:1562-1571.

3. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for Collie eye anomaly. *Genomics*. 2003;82:86-95.

4. Brown EA, Thomasy SM, Murphy CJ, Bannasch DL. Genetic analysis of optic nerve head coloboma in the Nova Scotia Duck Tolling Retriever identifies discordance with the NHEJ1 intronic deletion (collie eye anomaly mutation). Vet Ophthalmol. 2018 Mar;21(2):144-150. doi: 10.1111/vop.12488. Epub 2017 Jul 12. PMID: 28702949; PMCID: PMC5766432.

5. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563. PMID: 16938425

6. Marelli SP, Rizzi R, Paganelli A, Bagardi M, Minozzi G, Brambilla PG, Polli M. Genotypic and allelic frequency of a mutation in the *NHEJ1* gene associated with collie eye anomaly in dogs in Italy. Vet Rec Open. 2022 Jan 29;9(1):e26. doi: 10.1002/vro2.26. PMID: 35127102; PMCID: PMC8800487. **non-USA dog population**

OCULAR DISORDERS REPORT
NOVA SCOTIA DUCK TOLLING RETRIEVER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	6,018		1,328	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.0%	2	0.2%
10.000	GLAUCOMA	1	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.0%	0	0.0%
25.110	DISTICHIASIS	741	12.3%	161	12.1%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.2%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	10	0.2%	3	0.2%
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	5	0.1%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	5	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	161	2.7%	31	2.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	4	0.1%	0	0.0%
UVEA					
93.120	IRIS CYST	21	0.3%	4	0.3%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	133	2.2%	44	3.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	53	0.9%	1	0.1%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.0%	1	0.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	8	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	151	2.5%	106	8.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.0%	0	0.0%
95.120	CILIARY BODY CYST	1	0.0%	1	0.1%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	2	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	6	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.2%
LENS					
100.200	CATARACT, UNSPECIFIED	18	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	346	5.7%	85	6.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	50	0.8%	15	1.1%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	30	0.5%	6	0.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	18	0.3%	4	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.0%	5	0.4%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	19	0.3%	9	0.7%
100.306	PUNCTATE CATARACT, NUCLEUS	33	0.5%	19	1.4%
100.307	PUNCTATE CATARACT, CAPSULAR	31	0.5%	31	2.3%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	21	0.3%	6	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	36	0.6%	5	0.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	22	0.4%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	7	0.1%	2	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	12	0.2%	3	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	11	0.2%	9	0.7%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	13	0.2%	29	2.2%

OCULAR DISORDERS REPORT
NOVA SCOTIA DUCK TOLLING RETRIEVER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	6,018		1,328	
	Diagnostic Name	#	%	#	%
LENS Continued					
100.330	GENERALIZED/ COMPLETE CATARACT	7	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***324***	***5.4%***	***115***	***8.7%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	21	0.3%	10	0.8%
110.135	PHPV/ PTVL	7	0.1%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	1	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	12	0.2%	2	0.2%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	50	0.8%	2	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	13	0.2%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	97	1.6%	1	0.1%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	1	0.0%	1	0.1%
OPTIC NERVE					
130.110	MICROPAPILLA	13	0.2%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	13	0.2%	1	0.1%
130.150	OPTIC DISC COLOBOMA	3	0.0%	1	0.1%
OTHER					
900.000	OTHER, UNSPECIFIED	98	1.6%	0	0.0%
900.100	OTHER, NOT INHERITED	280	4.7%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	127	2.1%	81	6.1%
NORMAL					
.000	NORMAL GLOBE	4,474	74.3%	840	63.3%

OLD ENGLISH SHEEPDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular anomalies	Not defined	1, 2	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
D.	Cataract	Not defined	1, 3	NO
E.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
F.	Micropapilla	Not defined	1	Breeder option

Description and Comments

A. Microphthalmia with multiple congenital ocular defects

Microphthalmia is a developmental anomaly in which the eyeball is abnormally small. This is often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens and/or retina.

Microphthalmia with cataract and retinal abnormalities including retinal detachment, has been reported in litters of Old English Sheepdogs. Lesions were non-progressive. However, blindness did result in some dogs. The mode of inheritance is unknown, but affected dogs should not be bred.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. In one study of 66 interrelated Old English Sheepdogs, an autosomal recessive mode of inheritance was suggested. Retinal detachment was an associated finding in 5/43 affected dogs in this study. The location of the opacity within the lens and the age of onset was highly variable.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

F. Micropapilla

A congenital anomaly which results in a small optic disk diameter without vision loss. Contrast with optic nerve hypoplasia, which may have a similar ophthalmoscopic appearance with vision loss.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Barrie K. Posterior lenticonus, microphthalmia, cataracts and retinal folds in Old English Sheepdogs. *J Am Anim Hosp Assoc*. 1979;15:715.

3. Koch SA. Cataracts in interrelated Old English Sheepdogs. *J Am Vet Med Assoc*. 1972 Feb 1;160:299-301.

OCULAR DISORDERS REPORT
OLD ENGLISH SHEEPDOG

Diagnostic Name	1993-2017 #	1993-2017 %	2018-2022 #	2018-2022 %
Year Examined:	1993-2017		2018-2022	
Total # Dogs:	5,368		993	
GLOBE				
.110 MICROPHTHALMIA	10	0.2%	0	0.0%
10.000 GLAUCOMA	4	0.1%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	13	0.2%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	2	0.0%	0	0.0%
25.110 DISTICHIASIS	90	1.7%	22	2.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.0%	1	0.1%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	21	0.4%	8	0.8%
UVEA				
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150 IRIS COLOBOMA	1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	477	8.9%	156	15.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	8	0.1%	2	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	9	0.2%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	10	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.0%	3	0.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	3	0.1%	0	0.0%
93.810 UVEAL MELANOMA	1	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	0	0.0%	1	0.1%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	3	0.1%	1	0.1%
97.120 COLOBOMA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.2%
120.190 RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.1%
130.110 MICROPAPILLA	0	0.0%	2	0.2%
130.150 OPTIC DISC COLOBOMA	0	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	35	0.7%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	287	5.3%	67	6.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	71	1.3%	31	3.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	12	0.2%	3	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	11	0.2%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	6	0.1%	6	0.6%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	8	0.1%	6	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS	19	0.4%	4	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	21	0.4%	22	2.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	46	0.9%	13	1.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	46	0.9%	7	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	18	0.3%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	12	0.2%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	14	0.3%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	33	0.6%	5	0.5%

OCULAR DISORDERS REPORT
OLD ENGLISH SHEEPDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 5,368 #	 %	2018-2022 993 #	 %
LENS Continued				
100.317 INCIPIENT CATARACT, CAPSULAR	6	0.1%	4	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.1%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.1%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	2	0.0%	1	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	2	0.0%	6	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT	61	1.1%	2	0.2%
100.340 RESORBING/ HYPERMATURE CATARACT	2	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	6	0.1%	1	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***430***	***8.0%***	***112***	***11.3%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	17	0.3%	3	0.3%
110.135 PHPV/ PTVL	3	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	26	0.5%	1	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	92	1.7%	3	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	8	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	13	0.2%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	9	0.2%	0	0.0%
120.960 RETINOPATHY	5	0.1%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	18	0.3%	5	0.5%
130.120 OPTIC NERVE HYPOPLASIA	15	0.3%	0	0.0%
130.150 OPTIC DISC COLOBOMA	4	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	35	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	78	1.5%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	63	1.2%	25	2.5%
NORMAL				
.000 NORMAL GLOBE	4,265	79.5%	691	69.6%

OLD ENGLISH BULLDOGGE

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the OLD ENGLISH BULLDOGGE breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
OLDE ENGLISH BULLDOGGE

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 23 #	 %	Year Examined: 2018-2022 Total # Dogs: 18 #	 %
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	2	8.7%	0	0.0%
25.110	DISTICHIASIS	7	30.4%	3	16.7%
UVEA					
93.110	IRIS HYPOPLASIA	1	4.3%	0	0.0%
93.120	IRIS CYST	0	0.0%	1	5.6%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	4.3%	0	0.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	4.3%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	4.3%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	4.3%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	4.3%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***2***	***8.7%***	***0***	***0.0%***
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	5.6%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	5.6%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	5.6%
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	8.7%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	11	47.8%	12	66.7%

OTTERHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the OTTERHOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
OTTERHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 8 #	 %	Year Examined: 2018-2022 Total # Dogs: 2 #	 %
UVEA				
93.120 IRIS CYST	1	12.5%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	12.5%	0	0.0%
LENS				
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	1	50.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	50.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***0***	***0.0%***	***2***	***100.0%***
NORMAL				
.000 NORMAL GLOBE	7	87.5%	1	50.0%

PAPILLON

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
F.	Retinal atrophy (*CNGB1)*	Autosomal recessive	1, 2-5	NO	Mutation in the *CNGB1* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases,

persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Nuclear and posterior cortical cataracts have been reported in the Papillon.

E. Vitreous degeneration

A liquefaction of the vitreous gel, which may predispose to retinal detachment resulting in blindness.

F. Retinal atrophy - *CNGB1*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In one study of 707 dogs in Sweden, an autosomal recessive mode of inheritance was suggested. Clinical onset is reported at 5-6 years of age. In approximately 70% of cases of PRA in the Papillon, a *CNGB1* mutation is present, leading to an abnormal *CNGA1* protein in the rod outer segments. The mode of transmission is autosomal recessive. A genetic test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Haakanson N, Narfstrom K. Progressive retinal atrophy in Papillon dogs in Sweden: A clinical survey. *Prog Vet Comp Ophthal*. 1995;5:83.

3. Narfstrom K, Ekesten B. Electroretinographic evaluation of Papillons with and without hereditary retinal degeneration. *Am J Vet Res.* 1998;59:221-226.

4. Ahonen SJ, Arumilli M, Lohi H. A CNGB1 frameshift mutation in Papillon and Phalene dogs with progressive retinal atrophy. *PLoS One.* 2013;8:e72122.

5. Winkler PA, Ekenstedt KJ, Occelli LM, et al. A large animal model for CNGB1 autosomal recessive retinitis pigmentosa. *PLoS One*. 2013;8:e72229.

OCULAR DISORDERS REPORT
PAPILLON

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	11,198		1,464	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	9	0.1%	1	0.1%
10.000	GLAUCOMA	1	0.0%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	19	0.2%	3	0.2%
25.110	DISTICHIASIS	156	1.4%	30	2.0%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	8	0.1%	2	0.1%
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.0%	1	0.1%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	3	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	5	0.0%	1	0.1%
70.220	PIGMENTARY KERATITIS	2	0.0%	2	0.1%
70.700	CORNEAL DYSTROPHY	117	1.0%	19	1.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	4	0.0%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	2	0.0%	1	0.1%
93.120	IRIS CYST	4	0.0%	0	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	345	3.1%	42	2.9%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	7	0.1%	1	0.1%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	9	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	6	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	16	0.1%	6	0.4%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	6	0.1%	3	0.2%
93.810	UVEAL MELANOMA	0	0.0%	4	0.3%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	0	0.0%	1	0.1%
97.120	COLOBOMA	2	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	4	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	3	0.2%
120.960	RETINOPATHY	0	0.0%	1	0.1%
LENS					
100.200	CATARACT, UNSPECIFIED	19	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	369	3.3%	64	4.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	81	0.7%	26	1.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	22	0.2%	8	0.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	12	0.1%	4	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	9	0.1%	4	0.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	17	0.2%	5	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	32	0.3%	14	1.0%
100.307	PUNCTATE CATARACT, CAPSULAR	22	0.2%	8	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	89	0.8%	14	1.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	54	0.5%	13	0.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	34	0.3%	8	0.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	6	0.1%	0	0.0%

OCULAR DISORDERS REPORT
PAPILLON

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 11,198 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,464 #	 %
LENS Continued				
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	10	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	23	0.2%	5	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR	13	0.1%	2	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	5	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.0%	7	0.5%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	2	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	3	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	7	0.1%	1	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT	45	0.4%	5	0.3%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	5	0.0%	1	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***498***	***4.4%***	***132***	***9.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	42	0.4%	4	0.3%
110.135 PHPV/ PTVL	14	0.1%	1	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	40	0.4%	6	0.4%
110.320 VITREOUS DEGENERATION SYNERESIS	286	2.6%	21	1.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	67	0.6%	4	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	14	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	3	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	114	1.0%	4	0.3%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	8	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	1	0.1%
120.960 RETINOPATHY	3	0.0%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	8	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	12	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	3	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	77	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	204	1.8%	3	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	99	0.9%	62	4.2%
NORMAL				
.000 NORMAL GLOBE	9,630	86.0%	1,176	80.3%

PARSON RUSSELL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not define	1	Breeder option	
C.	Cataract	Not defined	1, 2	NO	
D.	Lens luxation	Autosomal recessive	3, 4	NO	Mutation in the *ADAMTS17* gene
E.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
F.	Retinal atrophy - generalized	Not defined	1	NO	
G.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	5	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may

involve the lens completely (diffuse) or in a localized region.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation may result in blinding retinal detachment and/or elevated intraocular pressure (glaucoma) causing vision impairment, pain, and blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

G. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Oberbauer AM, Hollingsworth SR, Belanger JM, et al. Inheritance of cataracts and primary lens luxation in Jack Russell Terriers. *Am J Vet Res*. 2008;69:222-227.

3. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010;51:4716-4721.

4. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384.

5. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
PARSON RUSSELL TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2,784		245	
	Diagnostic Name	#	%	#	%
EYELIDS					
25.110	DISTICHIASIS	69	2.5%	7	2.9%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	14	0.5%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	0	0.0%	1	0.4%
93.120	IRIS CYST	2	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	178	6.4%	32	13.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.0%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	6	0.2%	5	2.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.1%	1	0.4%
FUNDUS					
97.120	COLOBOMA	1	0.0%	0	0.0%
120.960	RETINOPATHY	0	0.0%	1	0.4%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	90	3.2%	14	5.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	18	0.6%	10	4.1%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	10	0.4%	2	0.8%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.1%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	4	0.1%	2	0.8%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	10	0.4%	5	2.0%
100.306	PUNCTATE CATARACT, NUCLEUS	7	0.3%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	7	0.3%	4	1.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	16	0.6%	1	0.4%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	41	1.5%	4	1.6%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.3%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	15	0.5%	3	1.2%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	10	0.4%	3	1.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.1%	1	0.4%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	3	1.2%
100.330	GENERALIZED/ COMPLETE CATARACT	11	0.4%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***166***	***6.0%***	***35***	***14.3%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	5	0.2%	5	2.0%
110.135	PHPV/ PTVL	1	0.0%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	9	0.3%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	36	1.3%	1	0.4%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	9	0.3%	1	0.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	25	0.9%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%

OCULAR DISORDERS REPORT
PARSON RUSSELL TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,784 #	 %	Year Examined: 2018-2022 Total # Dogs: 245 #	 %
RETINA Continued				
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	1	0.0%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	2	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	2	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	39	1.4%	0	0.0%
900.100 OTHER, NOT INHERITED	97	3.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	37	1.3%	20	8.2%
NORMAL				
.000 NORMAL GLOBE	2,388	85.8%	166	67.8%

PATTERDALE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Lens Luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Patterdale Terrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011; 14: 378-384. **non-USA dog population**

OCULAR DISORDERS REPORT
PATTERDALE TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 19 #	 %	Year Examined: 2018-2022 Total # Dogs: 1 #	 %
EYELIDS				
25.110 DISTICHIASIS	1	5.3%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	5.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	5.3%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	17	89.5%	1	100.0%

PEKINGESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1-3	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Exposure keratopathy syndrome	Not defined	1	Breeder option
D.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Exposure keratopathy syndrome

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macroblepharon and lagophthalmos. Macroblepharon is defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med.*

1976;20:39-67.

3. Gelatt KN. Pediatric ophthalmology in small animal practice. *Vet Clin North Am.* 1973;3:321.

4. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex. *American Journal of Veterinary Research.* 1974;35:571-574.

OCULAR DISORDERS REPORT
PEKINGESE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 227 #	 %	2018-2022 #	 %
GLOBE				
.110 MICROPHTHALMIA	1	0.4%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	2	1.7%
EYELIDS				
20.140 ECTOPIC CILIA	2	0.9%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	12	5.3%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	21	9.3%	22	18.6%
22.000 ECTROPION, UNSPECIFIED	2	0.9%	0	0.0%
25.110 DISTICHIASIS	24	10.6%	4	3.4%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.4%	1	0.8%
CORNEA				
70.210 PANNUS	7	3.1%	0	0.0%
70.220 PIGMENTARY KERATITIS	33	14.5%	15	12.7%
UVEA				
90.250 PIGMENTARY UVEITIS	0	0.0%	1	0.8%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	1	0.8%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.4%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	3	1.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	1.8%	1	0.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	3	1.3%	1	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.9%	1	0.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	2	1.7%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.4%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	5	2.2%	1	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	3	1.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	5	2.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	3	1.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.4%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	2	0.9%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.8%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.9%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***28***	***12.3%***	***6***	***5.1%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	0.4%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.4%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	1.3%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.4%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	1	0.4%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	6	2.6%	0	0.0%
900.100 OTHER, NOT INHERITED	11	4.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	9	4.0%	11	9.3%
NORMAL				
.000 NORMAL GLOBE	124	54.6%	74	62.7%

PEMBROKE WELSH CORGI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- iris to cornea	Not defined	1	NO
C.	Cataract	Not defined	1	NO
D.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Persistent pupillary membranes are a significant problem in this breed with frequent documentation of strands bridging from the iris to the cornea noted on routine screening eye examinations. These may be associated with corneal opacity which may result in vision impairment, thus the recommendation against breeding Pembroke Welsh Corgis with PPM.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
PEMBROKE WELSH CORGI

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	20,674		4,225	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	19	0.1%	2	0.0%
10.000	GLAUCOMA	1	0.0%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	2	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	3	0.0%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110	DISTICHIASIS	352	1.7%	55	1.3%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.0%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	7	0.0%	2	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	7	0.0%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	3	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	2	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	66	0.3%	17	0.4%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	70	0.3%	3	0.1%
UVEA					
90.250	PIGMENTARY UVEITIS	0	0.0%	1	0.0%
93.110	IRIS HYPOPLASIA	4	0.0%	2	0.0%
93.120	IRIS CYST	8	0.0%	1	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	8	0.0%	0	0.0%
93.150	IRIS COLOBOMA	5	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	3	0.0%	3	0.1%
93.180	IIRIS SPHINCTER DYSPLASIA	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3,815	18.5%	749	17.7%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	68	0.3%	13	0.3%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	412	2.0%	46	1.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	15	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	0.0%	1	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	57	0.3%	42	1.0%
95.120	CILIARY BODY CYST	0	0.0%	1	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	5	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	66	1.6%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	3	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.0%
120.960	RETINOPATHY	0	0.0%	6	0.1%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	79	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	471	2.3%	102	2.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	80	0.4%	23	0.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	69	0.3%	14	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	34	0.2%	11	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	4	0.0%	1	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	31	0.1%	6	0.1%
100.306	PUNCTATE CATARACT, NUCLEUS	78	0.4%	21	0.5%

OCULAR DISORDERS REPORT
PEMBROKE WELSH CORGI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 20,674 #	 %	2018-2022 4,225 #	 %
LENS Continued				
100.307 PUNCTATE CATARACT, CAPSULAR	41	0.2%	26	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	119	0.6%	9	0.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	188	0.9%	20	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	72	0.3%	10	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	7	0.0%	2	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	21	0.1%	3	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	205	1.0%	29	0.7%
100.317 INCIPIENT CATARACT, CAPSULAR	29	0.1%	7	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	8	0.0%	5	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	13	0.1%	3	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	5	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	20	0.1%	17	0.4%
100.327 INCOMPLETE CATARACT, CAPSULAR	2	0.0%	1	0.0%
100.328 Y-SUTURE TIP OPACITIES	7	0.0%	10	0.2%
100.330 GENERALIZED/ COMPLETE CATARACT	77	0.4%	4	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,182***	***5.7%***	***217***	***5.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	74	0.4%	25	0.6%
110.135 PHPV/ PTVL	22	0.1%	4	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	8	0.0%	3	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	91	0.4%	6	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1,226	5.9%	99	2.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	173	0.8%	12	0.3%
120.190 RETINAL DYSPLASIA, DETACHED	3	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	36	0.2%	0	0.0%
120.400 RETINAL HEMORRHAGE	7	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	6	0.0%	0	0.0%
120.960 RETINOPATHY	8	0.0%	3	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	6	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	9	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	2	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	125	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED	313	1.5%	2	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	254	1.2%	109	2.6%
NORMAL				
.000 NORMAL GLOBE	14,680	71.0%	2,954	69.9%

PERRO DE PRESA CANARIO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Multifocal retinopathy - *cmr1*	Autosomal recessive	1	NO (Breeder option with Normal DNA test for CMR)	Mutation in the *CNGB3* gene

Description and Comments

A. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

References

1. Yeh CY, Goldstein O, Kukekova AV, Holley D, Knollinger AM, Huson HJ, Pearce-Kelling SE, Acland GM, Komáromy AM. Genomic deletion of CNGB3 is identical by descent in multiple canine breeds and causes achromatopsia. BMC Genet. 2013 Apr 20;14:27. doi: 10.1186/1471-2156-14-27. PMID: 23601474

OCULAR DISORDERS REPORT
PERRO DE PRESA CANARIO

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	9		10	
	Diagnostic Name	**#**	**%**	**#**	**%**
GLOBE					
10.000	GLAUCOMA	1	11.1%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	22.2%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	11.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	11.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	1	11.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	1	11.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***3***	***33.3%***	***0***	***0.0%***
OTHER					
900.100	OTHER, NOT INHERITED	1	11.1%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	6	66.7%	10	100.0%

PERUVIAN INCA ORCHID

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
PERUVIAN INCA ORCHID

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	29		51	
	Diagnostic Name	**#**	**%**	**#**	**%**
GLOBE					
.110	MICROPHTHALMIA	2	6.9%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	3.4%	1	2.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	3.4%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	1	2.0%
100.306	PUNCTATE CATARACT, NUCLEUS	1	3.4%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	2	6.9%	2	3.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1	3.4%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	3.4%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	3.4%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	3.4%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	3.4%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	3.4%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***9***	***31.0%***	***3***	***5.9%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	1	2.0%
RETINA					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	3.9%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	3	5.9%
120.960	RETINOPATHY	0	0.0%	2	3.9%
OTHER					
900.000	OTHER, UNSPECIFIED	1	3.4%	0	0.0%
900.100	OTHER, NOT INHERITED	0	0.0%	1	2.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	3.4%	1	2.0%
NORMAL					
.000	NORMAL GLOBE	26	89.7%	41	80.4%

PETIT BASSET GRIFFON VENDEEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma – POAG	Autosomal recessive	2-4	NO	Mutation in the *ADAMTS17* gene
B.	Corneal dystrophy				
	- endothelial	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to cornea	Not defined	1	NO	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
	- endothelial opacity/no strands	Not defined	1	NO	
D.	Cataract	Not defined	1	NO	
E.	Lens luxation	Autosomal recessive	4	NO	Mutation in the *ADAMTS17* gene
F.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

Primary Open Angle Glaucoma (POAG) in the Petit Basset Griffon Vendeen is caused by an inversion with a breakpoint disrupting the *ADAMTS17* gene. Pectinate ligament abnormalities are not present on gonioscopy and the iridocorneal angle remains open. The initial clinical features are noted around 3-4 years and include a small rise in intraocular pressure accompanied by lens subluxation. Retinal degeneration and optic nerve cupping noted in late stages when globe enlargement and vision disruption has occurred. A DNA test is available.

B. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does

not occur until the animal is older.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Lens Luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from OFA All-Breeds Report, 1991-1998.

2. Forman OP, Pettitt L, Komaromy AM, et al. A Novel Genome-Wide Association Study Approach Using Genotyping by Exome Sequencing Leads to the Identification of a Primary Open Angle Glaucoma Association Inversion Disrupting ADAMTS17; PLoS one, 2015: 10(12):e0143546.

3. Jeanes EC, Oliver JAC, Ricketts SL, Gould DJ, Mellersh CS. Glaucoma-causing *ADAMTS17* mutations are also reproducibly associated with height in two domestic dog breeds: selection for short stature may have contributed to increased prevalence of glaucoma. Canine Genet Epidemiol. 2019 May 17;6:5. doi: 10.1186/s40575-019-0071-6. PMID: 31131111; PMCID: PMC6524303. **reference derived from non-USA dog population**

4. Bedford, PGC (2017), Open-angle glaucoma in the Petit Basset Griffon Vendeen. Vet Ophthalmol, 20: 98-102. doi.10.1111/vop.12369. **reference derived from non-USA dog population**

OCULAR DISORDERS REPORT
PETIT BASSET GRIFFON VENDEEN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,515 #	 %	2018-2022 202 #	 %
GLOBE				
10.000 GLAUCOMA	3	0.1%	1	0.5%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	3	0.1%	0	0.0%
25.110 DISTICHIASIS	11	0.4%	0	0.0%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	17	0.7%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	26	1.0%	0	0.0%
UVEA				
93.120 IRIS CYST	3	0.1%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	2	0.1%	0	0.0%
93.150 IRIS COLOBOMA	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	482	19.2%	29	14.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	36	1.4%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	215	8.5%	10	5.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	15	0.6%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	19	0.8%	6	3.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	66	2.6%	21	10.4%
95.120 CILIARY BODY CYST	1	0.0%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	112	4.5%	7	3.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	41	1.6%	4	2.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	7	0.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	3	0.1%	1	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	4	0.2%	1	0.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	18	0.7%	2	1.0%
100.306 PUNCTATE CATARACT, NUCLEUS	3	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	22	0.9%	2	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	25	1.0%	2	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	7	0.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	5	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	6	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	3	0.1%	1	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	13	0.5%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	4	0.2%	2	1.0%
100.330 GENERALIZED/ COMPLETE CATARACT	12	0.5%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.4%	1	0.5%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***172***	***6.8%***	***13***	***6.4%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	12	0.5%	1	0.5%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	9	0.4%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	4	2.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	112	4.5%	2	1.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	11	0.4%	0	0.0%

OCULAR DISORDERS REPORT
PETIT BASSET GRIFFON VENDEEN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,515 #	 %	Year Examined: 2018-2022 Total # Dogs: 202 #	 %
RETINA Continued				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.1%	0	0.0%
120.400 RETINAL HEMORRHAGE	2	0.1%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	3	0.1%	1	0.5%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	38	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED	77	3.1%	4	2.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	47	1.9%	5	2.5%
NORMAL				
.000 NORMAL GLOBE	1,611	64.1%	134	66.3%

PHARAOH HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	-lens pigment foci	Not defined	1	Passes with no notation
B.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
PHARAOH HOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 432 #	 %	2018-2022 133 #	 %
EYELIDS				
25.110 DISTICHIASIS	7	1.6%	1	0.8%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.2%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	3	0.7%	1	0.8%
UVEA				
93.120 IRIS CYST	1	0.2%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	32	7.4%	12	9.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	11	2.5%	8	6.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.2%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	1	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	27	6.3%	6	4.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	7	1.6%	2	1.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.7%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.2%	2	1.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.5%	1	0.8%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.2%	1	0.8%
100.307 PUNCTATE CATARACT, CAPSULAR	5	1.2%	2	1.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	2	0.5%	1	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	2	0.5%	1	0.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	3	0.7%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	4	0.9%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.2%	1	0.8%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	2	0.5%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.2%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***34***	***7.9%***	***11***	***8.3%***
VITREOUS				
110.320 VITREOUS DEGENERATION SYNERESIS	0	0.0%	3	2.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	3	0.7%	1	0.8%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.5%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.7%	0	0.0%
120.960 RETINOPATHY	0	0.0%	3	2.3%
OTHER				
900.000 OTHER, UNSPECIFIED	4	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	7	1.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	0.9%	8	6.0%
NORMAL				
.000 NORMAL GLOBE	350	81.0%	93	69.9%

PICARDY SPANIEL

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the PICARDY SPANIEL breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
PICARDY SPANIEL

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	0		1	
Diagnostic Name	**#**	**%**	**#**	**%**
NORMAL				
.000 NORMAL GLOBE	0		1	100.0%

PLOTT

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	(*prcd*)	Autosomal recessive	1-3	NO	Mutation in the *prcd* gene

Description and Comments

A. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Plott is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Plott. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

3. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
PLOTT

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 5 #	 %	Year Examined: 2018-2022 Total # Dogs: 4 #	 %
NORMAL				
.000 NORMAL GLOBE	5	100.0%	4	100.0%

POINTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

Description and Comments

A. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
POINTER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 749 #	 %	2018-2022 149 #	 %
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	5	0.7%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110 DISTICHIASIS	4	0.5%	0	0.0%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	10	1.3%	2	1.3%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	12	1.6%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	20	2.7%	2	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.1%	1	0.7%
100.306 PUNCTATE CATARACT, NUCLEUS	4	0.5%	2	1.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	3	0.4%	1	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.1%	1	0.7%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	1	0.7%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.1%	1	0.7%
100.328 Y-SUTURE TIP OPACITIES	1	0.1%	1	0.7%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***16***	***2.1%***	***7***	***4.7%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	7	0.9%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	3	0.4%	1	0.7%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2	0.3%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	4	0.5%	1	0.7%
130.120 OPTIC NERVE HYPOPLASIA	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	7	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	6	0.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	14	1.9%	6	4.0%
NORMAL				
.000 NORMAL GLOBE	670	89.5%	134	89.9%

POLISH LOWLAND SHEEPDOG

(Polski Owczarek Nizinny)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	-epithelial/stromal	Not defined	1	Breeder option	
C	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- rod-cone dysplasia type 1 (*rcd4*)	Autosomal recessive	4	NO	Mutation in the *C17H2orf71* gene
	- late onset (LOPRA)	Autosomal recessive	2	NO	Mutation in the *C2orf71* gene
F.	Ceroid lipofuscinosis	Not defined	3	NO	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3

months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is available.

A form of PRA, similar to that found in Gordon and Irish setters, has also been found in the the Polish Lowland Sheepdog. This form of PRA has been referred to as late-onset, slowly progressive PRA (LOPRA). Slight vascular attenuation, first seen between 4.5 -6 years of age precedes tapetal hyperreflectivity. All fundic changes were bilaterally symmetric and progressed slowly eventually causing clinical blindness, bilateral complete vascular attenuation, and tapetal hyperreflectivity by 12 years of age, on average. Almost all affected dogs were homozygous for the rcd4 mutation in *C17H2orf71* gene. A DNA test is available.

F. Ceroid lipofuscinosis

A systemic metabolic disorder that affects the retina and retinal pigment epithelium with accumulation of lipopigments resulting in retinal degeneration.

Historical Note:

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. *Anim Genet*. 2012;44:169-177.

3. Narfstrom K, Wrigstad A, Ekesten B, et al. Neuronal ceroid lipofuscinosis: clinical and morphologic findings in nine affected Polish Owczarek Nizinny (PON) dogs. *Vet Ophthalmol*. 2007;10:111-120.

4. Karlskov-Mortensen P, Proschowsky HF, Gao F, Fredholm M. Identification of the mutation causing

progressive retinal atrophy in Old Danish Pointing Dog. Anim Genet. 2018 Jun;49(3):237-241. doi: 10.1111/age.12659. Epub 2018 Apr 6. PMID: 29624701.

OCULAR DISORDERS REPORT
POLISH LOWLAND SHEEPDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,149 #	 %	Year Examined: 2018-2022 Total # Dogs: 173 #	 %
EYELIDS				
25.110 DISTICHIASIS	18	1.6%	6	3.5%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.2%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	32	2.8%	8	4.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	2	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	78	6.8%	21	12.1%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	49	4.3%	10	5.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	13	1.1%	11	6.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	9	0.8%	1	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.3%	2	1.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.1%	1	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR	4	0.3%	2	1.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	7	0.6%	1	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	4	0.3%	1	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.2%	2	1.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	3	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.1%	4	2.3%
100.317 INCIPIENT CATARACT, CAPSULAR	3	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.2%	2	1.2%
100.328 Y-SUTURE TIP OPACITIES	1	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***58***	***5.0%***	***27***	***15.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	2	0.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	10	0.9%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	19	1.7%	2	1.2%
120.960 RETINOPATHY	1	0.1%	0	0.0%
FUNDUS				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.6%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.6%
OTHER				
900.000 OTHER, UNSPECIFIED	5	0.4%	0	0.0%
900.100 OTHER, NOT INHERITED	24	2.1%	1	0.6%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	0.3%	7	4.0%
NORMAL				
.000 NORMAL GLOBE	963	83.8%	113	65.3%

POLISH TATRA SHEEPDOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the POLISH TATRA SHEEPDOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
POLISH TATRA SHEEPDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2 #	%	2018-2022 0 #	%
LENS				
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	50.0%	0	
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	50.0%	0	
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***2***	***100.0%***	***0***	
NORMAL				
.000 NORMAL GLOBE	1	50.0%	0	

POMERANIAN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Entropion	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- rod-cone dysplasia type 3 (*rcd3*)	Autosomal recessive	2	NO	Mutation in the *PDE6A* gene
	- *prcd*	Autosomal recessive	2, 3	NO	Mutation in the *prcd* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward head conformation that minimizes or eliminates the likelihood of the defect.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Retinal atrophy

- rod-cone dysplasia type 3 (*rcd3*)

PRA is an autosomal recessive trait caused by a one base pair deletion in the gene encoding the alpha subunit of cyclic GMP phosphodiesterase (rcd3). PRA begins early in life with clinical signs of night blindness and a lack of rod ERG responses is seen at 6-8 weeks of age. Dogs are completely blind by 2-3 years of age when ophthalmoscopic signs are first visible. The mutation is found in the *PDE6A* gene. A DNA test is available.

Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Pomeranian is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

3. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

OCULAR DISORDERS REPORT
POMERANIAN

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,338		1,251	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	3	0.2%	3	0.2%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.1%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	9	0.7%	63	5.0%
22.000	ECTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110	DISTICHIASIS	56	4.2%	48	3.8%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.1%	1	0.1%
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.1%	0	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	0	0.0%	1	0.1%
CORNEA					
70.210	PANNUS	1	0.1%	0	0.0%
70.220	PIGMENTARY KERATITIS	2	0.1%	2	0.2%
70.700	CORNEAL DYSTROPHY	3	0.2%	4	0.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	0	0.0%	1	0.1%
93.150	IRIS COLOBOMA	1	0.1%	1	0.1%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	80	6.0%	119	9.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.2%	2	0.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	4	0.3%	1	0.1%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	7	0.5%	14	1.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.1%	2	0.2%
93.810	UVEAL MELANOMA	1	0.1%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.1%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	1	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	33	2.5%	13	1.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	7	0.5%	9	0.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.1%	2	0.2%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.1%	1	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.2%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.4%	1	0.1%
100.307	PUNCTATE CATARACT, CAPSULAR	2	0.1%	3	0.2%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	13	1.0%	6	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	8	0.6%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	4	0.3%	6	0.5%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	2	0.1%	3	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	0	0.0%	4	0.3%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	0.1%
100.330	GENERALIZED/ COMPLETE CATARACT	11	0.8%	1	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.1%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	0	0.0%	1	0.1%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***64***	***4.8%***	***37***	***3.0%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	4	0.3%	1	0.1%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%

OCULAR DISORDERS REPORT
POMERANIAN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,338 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,251 #	 %
VITREOUS Continued				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.3%	5	0.4%
110.320 VITREOUS DEGENERATION SYNERESIS	15	1.1%	4	0.3%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	5	0.4%	2	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	3	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	17	1.3%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.1%	0	0.0%
120.960 RETINOPATHY	2	0.1%	0	0.0%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	2	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	2	0.1%	1	0.1%
OTHER				
900.000 OTHER, UNSPECIFIED	10	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	27	2.0%	2	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	16	1.2%	42	3.4%
NORMAL				
.000 NORMAL GLOBE	1,097	82.0%	941	75.2%

POODLE

(Standard)

*Up until 2022, the toy/miniature/standard poodle conditions were assessed as a group, therefore statistics prior to this date may not reflect the real incidence within the breed subgroups. From 2021, the Standard Poodle is assessed separately from the Toy & Miniature varieties, and conditions may be added or removed from each page as statistics start to be generated.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1, 2-4	NO	
E.	Y-suture tip opacity	Not defined	1	Breeder option	
F.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1, 10-20	NO	Mutation in the *prcd* gene
	- rod-cone dysplasia type 4 (*rcd4*)	Autosomal recessive	21	NO	Mutation in the *C2orf71* gene
H.	Day blindness/retinal degeneration	Autosomal recessive	1	NO	Mutation has not been published
I.	Micropapilla	Not defined	1	Breeder option	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The Poodle cataract can involve the lens cortex and lens nucleus. The rate and degree of progression are variable. A familial form of cataract has been described in the Standard Poodle, beginning with an equatorial opacity initially observed in dogs prior to 2 years of age.

E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.

These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

F. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment and/or glaucoma. Either condition may cause blindness.

G. Retinal atrophy

- prcd

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that PRA in the Poodle is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available. It is important to note that in all breeds in which a molecular diagnostic test for the disease is available, it is possible to have dogs diagnosed clinically as affected, yet the DNA test results are normal. This suggests that other genetic causes of PRA exist or that the diagnosed affected dog has an acquired disease that mimics the inherited disorder.

- rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

H. Day blindness/tetinal degeneration

An autosomal recessive disorder of standard poodles and ‘Doodles’ (where the mix-bred dogs are backcrossed to standard poodles that carry the genetic defect); the disease also has been referred to as achromatopsia. The salient clinical findings is profound visual difficulty in bright light, day blindness, with subjective normal night vision. In the early stages of the disease, fundus examination is normal with some dogs showing focal hyperreflectivity of the cone-rich fovea like region of the retina; the photopic ERG is not recordable. In some older dogs, there is progression resulting in poor/absent vision under both dim and bright light conditions, markedly abnormal or non-recordable ERG, and a fundus appearance indicative of late stage retinal degeneration and indistinguishable from progressive retinal atrophy.

I. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Rubin LF, Flowers RD. Inherited cataract in a family of Standard Poodles. *J Am Vet Med Assoc*. 1972;161:207-208.

3. Barnett KC, Startup FG. Hereditary cataract in the standard poodle. *Vet Rec*. 1985;117:15-16.

4. Gelatt KN, Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol*. 2005;8:101-111.

5. Barnett KC. Canine retinopathies III. The other breeds. *J Small Anim Pract*. 1965;6:185-196.

6. Barnett KC. Hereditary retinal atrophy in the Poodle. *Vet Rec*. 1962;74:672-675.

7. Aguirre G, Alligood J, O'Brien P, et al. Pathogenesis of progressive rod-cone degeneration in Miniature Poodles. *Invest Ophthalmol Vis Sci*. 1982;23:610-630.

8. Barnett KC. Two forms of hereditary and progressive retinal atrophy in the dog. I. The Miniature Poodle. II. The Labrador retriever. *J Am Anim Hosp Assoc*. 1965:234-245.

9. Aguirre GD, Rubin LF. Progressive retinal atrophy in the Miniature Poodle: an electrophysiologic study. *J Am Vet Med Assoc*. 1972;160:191-201.

10. Aguirre GD, al e. Hereditary retinal degeneration in the dog: Specificity of abnormal cyclic nucleotide metabolism to diseases of arrested photoreceptor development. *Birth Defects*. 1982;18:119-134.

11. Parkes JH, Aguirre G, Rockey JH, et al. Progressive rod-cone degeneration in the dog: characterization of the visual pigment. *Invest Ophthalmol Vis Sci*. 1982;23:674-678.

12. Sandberg MA, Pawlyk BS, Berson EL. Full-field electroretinograms in Miniature Poodles with progressive rod-cone degeneration. *Invest Ophthalmol Vis Sci*. 1986;27:1179-1184.

13. Aguirre G, O'Brien P. Morphological and biochemical studies of canine progressive rod-cone degeneration. 3H-fucose autoradiography. *Invest Ophthalmol Vis Sci*. 1986;27:635-655.

14. Aguirre GD, Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. *Exp Eye Res*. 1988;46:663-687.

15. Ray K, Acland GM, Aguirre GD. Nonallelism of erd and prcd and exclusion of the canine RDS/peripherin gene as a candidate for both retinal degeneration loci. *Invest Ophthalmol Vis Sci*. 1996;37:783-794.

16. Alvarez RA, Aguirre GD, Acland GM, et al. Docosapentaenoic acid is converted to docosahexaenoic acid in the retinas of normal and prcd-affected miniature poodle dogs. *Invest Ophthalmol Vis Sci*. 1994;35:402-408.

17. Kemp CM, Jacobson SG. Rhodopsin levels in the central retinas of normal Miniature Poodles and those with progressive rod-cone degeneration. *Exp Eye Res*. 1992;54:947-956.

18. Wetzel MG, Fahlman C, Maude MB, et al. Fatty acid metabolism in normal Miniature Poodles and those affected with progressive rod-cone degeneration (prcd). *Prog Clin Biol Res*. 1989;314:427-439.

19. Gaiddon J, Lallemeal PE, Peiffer RL, Jr. Positive correlation between coat color and electroretinographically diagnosed progressive retinal atrophy in Miniature Poodles in southern France. *Prog Vet Comp Ophthal*. 1995;5:74-77.

20. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

21. Downs et al., Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. Animal Genet. 2013 Apr:44(2): 169-77

OCULAR DISORDERS REPORT
POODLE, STANDARD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 22,284 #	 %	Year Examined: 2018-2022 Total # Dogs: 26,592 #	 %
GLOBE				
.110 MICROPHTHALMIA	4	0.0%	0	0.0%
10.000 GLAUCOMA	4	0.0%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	0	0.0%	4	0.0%
21.000 ENTROPION, UNSPECIFIED	80	0.4%	72	0.3%
22.000 ECTROPION, UNSPECIFIED	0	0.0%	4	0.0%
25.110 DISTICHIASIS	336	1.5%	412	1.5%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	16	0.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	24	0.1%	4	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	8	0.0%	4	0.0%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	4	0.0%	0	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY	44	0.2%	32	0.1%
CORNEA				
70.220 PIGMENTARY KERATITIS	4	0.0%	4	0.0%
70.700 CORNEAL DYSTROPHY	116	0.5%	144	0.5%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	12	0.1%	0	0.0%
UVEA				
90.250 PIGMENTARY UVEITIS	0	0.0%	4	0.0%
93.110 IRIS HYPOPLASIA	0	0.0%	12	0.0%
93.120 IRIS CYST	8	0.0%	12	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	572	2.6%	620	2.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	8	0.0%	12	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	8	0.0%	4	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	528	2.4%	612	2.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	12	0.1%	16	0.1%
93.810 UVEAL MELANOMA	12	0.1%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,600	7.2%	1,108	4.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	868	3.9%	564	2.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	180	0.8%	84	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	192	0.9%	144	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	120	0.5%	84	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	280	1.3%	112	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS	132	0.6%	96	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	332	1.5%	312	1.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	156	0.7%	184	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	124	0.6%	88	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	140	0.6%	112	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	8	0.0%	20	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	40	0.2%	36	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	72	0.3%	56	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	56	0.3%	60	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	20	0.1%	40	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	24	0.1%	24	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	32	0.1%	12	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	16	0.1%	20	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	8	0.0%	4	0.0%
100.328 Y-SUTURE TIP OPACITIES	168	0.8%	224	0.8%
100.330 GENERALIZED/ COMPLETE CATARACT	20	0.1%	4	0.0%

OCULAR DISORDERS REPORT
POODLE, STANDARD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 22,284 #	 %	Year Examined: 2018-2022 Total # Dogs: 26,592 #	 %
LENS Continued				
100.340 RESORBING/ HYPERMATURE CATARACT	4	0.0%	4	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***2,824***	***12.7%***	***2,060***	***7.7%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	68	0.3%	32	0.1%
110.135 PHPV/ PTVL	16	0.1%	4	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	12	0.1%	4	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	44	0.2%	60	0.2%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	12	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	8	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	8	0.0%
130.110 MICROPAPILLA	0	0.0%	36	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	92	0.4%	72	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	4	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	4	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	24	0.1%	16	0.1%
120.920 RETINAL DETACHMENT WITH DIALYSIS	8	0.0%	0	0.0%
120.960 RETINOPATHY	32	0.1%	12	0.0%
120.970 CMR/ CMR-LIKE RETINOPATY	0	0.0%	4	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	96	0.4%	28	0.1%
130.120 OPTIC NERVE HYPOPLASIA	8	0.0%	0	0.0%
OTHER				
900.100 OTHER, NOT INHERITED	64	0.3%	4	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,072	4.8%	996	3.7%
NORMAL				
.000 NORMAL GLOBE	17,376	78.0%	21,896	82.3%

POODLE

(Miniature and Toy varieties)

*Up until 2022, the toy/miniature/standard poodle conditions were assessed as a group, therefore statistics prior to this date may not reflect the real incidence within the breed subgroups. From 2021, the Standard Poodle is assessed separately from the Toy & Miniature varieties, and conditions may be added or removed from each page as statistics start to be generated.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1, 2-4	NO	
E.	Y-suture tip opacity	Not defined	1	Breeder option	
F.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1, 5-15	NO	Mutation in the *prcd* gene
	- rod-cone dysplasia type 4 (*rcd4*)	Autosomal recessive	16-20	NO	Mutation in the *C2orf71* gene *only in Miniatures
H.	Micropapilla	Not defined	1	Breeder option	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The Poodle cataract can involve the lens cortex and lens nucleus. The rate and degree of progression are variable. A familial form of cataract has been described in the Standard Poodle, beginning with an equatorial opacity initially observed in dogs prior to 2 years of age.

E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.

These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

F. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment and/or glaucoma. Either condition may cause blindness.

G. Retinal atrophy

- prcd

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that PRA in the Poodle is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available. It is important to note that in all breeds in which a molecular diagnostic test for the disease is available, it is possible to have dogs diagnosed clinically as affected, yet the DNA test results are normal. This suggests that other genetic causes of PRA exist or that the diagnosed affected dog has an acquired disease that mimics the inherited disorder.

- Rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

H. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Rubin LF, Flowers RD. Inherited cataract in a family of Standard Poodles. *J Am Vet Med Assoc*. 1972;161:207-208.

3. Barnett KC, Startup FG. Hereditary cataract in the standard poodle. *Vet Rec*. 1985;117:15-16.

4. Gelatt KN, Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol*. 2005;8:101-111.

5. Aguirre GD, al e. Hereditary retinal degeneration in the dog: Specificity of abnormal cyclic nucleotide metabolism to diseases of arrested photoreceptor development. *Birth Defects*. 1982;18:119-134.

6. Parkes JH, Aguirre G, Rockey JH, et al. Progressive rod-cone degeneration in the dog: characterization of the visual pigment. *Invest Ophthalmol Vis Sci*. 1982;23:674-678.

7. Sandberg MA, Pawlyk BS, Berson EL. Full-field electroretinograms in Miniature Poodles with progressive rod-cone degeneration. *Invest Ophthalmol Vis Sci*. 1986;27:1179-1184.

8. Aguirre G, O'Brien P. Morphological and biochemical studies of canine progressive rod-cone degeneration. 3H-fucose autoradiography. *Invest Ophthalmol Vis Sci*. 1986;27:635-655.

9. Aguirre GD, Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. *Exp Eye Res*. 1988;46:663-687.

10. Ray K, Acland GM, Aguirre GD. Nonallelism of erd and prcd and exclusion of the canine RDS/peripherin gene as a candidate for both retinal degeneration loci. *Invest Ophthalmol Vis Sci*. 1996;37:783-794.

11. Alvarez RA, Aguirre GD, Acland GM, et al. Docosapentaenoic acid is converted to docosahexaenoic acid in the retinas of normal and prcd-affected miniature poodle dogs. *Invest Ophthalmol Vis Sci*. 1994;35:402-408.

12. Kemp CM, Jacobson SG. Rhodopsin levels in the central retinas of normal Miniature Poodles and those with progressive rod-cone degeneration. *Exp Eye Res*. 1992;54:947-956.

13 Wetzel MG, Fahlman C, Maude MB, et al. Fatty acid metabolism in normal Miniature Poodles and those affected with progressive rod-cone degeneration (prcd). *Prog Clin Biol Res*. 1989;314:427-439.

14. Gaiddon J, Lallemeal PE, Peiffer RL, Jr. Positive correlation between coat color and electroretinographically diagnosed progressive retinal atrophy in Miniature Poodles in southern France. *Prog Vet Comp Ophthal*. 1995;5:74-77.

15. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

16. Barnett KC. Canine retinopathies III. The other breeds. *J Small Anim Pract*. 1965;6:185-196.

17. Barnett KC. Hereditary retinal atrophy in the Poodle. *Vet Rec*. 1962;74:672-675.

18. Aguirre G, Alligood J, O'Brien P, et al. Pathogenesis of progressive rod-cone degeneration in Miniature Poodles. *Invest Ophthalmol Vis Sci*. 1982;23:610-630.

19. Barnett KC. Two forms of hereditary and progressive retinal atrophy in the dog. I. The Miniature Poodle. II. The Labrador retriever. *J Am Anim Hosp Assoc*. 1965:234-245.

20. Aguirre GD, Rubin LF. Progressive retinal atrophy in the Miniature Poodle: an electrophysiologic study. *J Am Vet Med Assoc*. 1972;160:191-201.

OCULAR DISORDERS REPORT
POODLE, TOY AND MINIATURE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	13,556		19,796	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	8	0.1%	24	0.1%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	4	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	16	0.1%	28	0.1%
21.000	ENTROPION, UNSPECIFIED	12	0.1%	20	0.1%
22.000	ECTROPION, UNSPECIFIED	0	0.0%	4	0.0%
25.110	DISTICHIASIS	1,432	10.6%	2,176	11.0%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	40	0.2%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	24	0.2%	16	0.1%
40.910	KERATOCONJUNCTIVITIS SICCA	4	0.0%	4	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	0	0.0%	8	0.0%
CORNEA					
70.220	PIGMENTARY KERATITIS	16	0.1%	12	0.1%
70.700	CORNEAL DYSTROPHY	72	0.5%	84	0.4%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	4	0.0%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	0	0.0%	8	0.0%
93.120	IRIS CYST	4	0.0%	4	0.0%
93.150	IRIS COLOBOMA	4	0.0%	4	0.0%
93.170	ANTERIOR CHAMBER CYST	0	0.0%	4	0.0%
93.180	IIRIS SPHINCTER DYSPLASIA	4	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1,356	10.0%	1,780	9.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	60	0.4%	64	0.3%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	16	0.1%	4	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	180	1.3%	420	2.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	0	0.0%	16	0.1%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	8	0.1%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	624	4.6%	572	2.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	324	2.4%	260	1.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	120	0.9%	88	0.4%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	52	0.4%	64	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	8	0.1%	28	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	216	1.6%	100	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	28	0.2%	24	0.1%
100.307	PUNCTATE CATARACT, CAPSULAR	120	0.9%	132	0.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	116	0.9%	176	0.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	124	0.9%	76	0.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	52	0.4%	28	0.1%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	4	0.0%	16	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	36	0.3%	64	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	16	0.1%	24	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	32	0.2%	12	0.1%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	56	0.4%	36	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	56	0.4%	56	0.3%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	12	0.1%	12	0.1%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	4	0.0%	0	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	4	0.0%	8	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	8	0.0%

OCULAR DISORDERS REPORT
POODLE, TOY AND MINIATURE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 13,556 #	 %	Year Examined: 2018-2022 Total # Dogs: 19,796 #	 %
LENS Continued				
100.327 INCOMPLETE CATARACT, CAPSULAR	8	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	104	0.8%	220	1.1%
100.330 GENERALIZED/ COMPLETE CATARACT	48	0.4%	28	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	8	0.1%	4	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	8	0.1%	4	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,444***	***10.7%***	***1,244***	***6.3%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	100	0.7%	72	0.4%
110.135 PHPV/ PTVL	12	0.1%	8	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	36	0.3%	40	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS	172	1.3%	96	0.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	4	0.0%	8	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	8	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	28	0.2%	12	0.1%
120.920 RETINAL DETACHMENT WITH DIALYSIS	8	0.1%	4	0.0%
120.960 RETINOPATHY	12	0.1%	16	0.1%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	16	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	4	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	8	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	8	0.0%
120.960 RETINOPATHY	0	0.0%	12	0.1%
130.110 MICROPAPILLA	0	0.0%	60	0.3%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	60	0.3%
130.150 OPTIC DISC COLOBOMA	0	0.0%	28	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	208	1.5%	56	0.3%
130.120 OPTIC NERVE HYPOPLASIA	136	1.0%	84	0.4%
130.150 OPTIC DISC COLOBOMA	16	0.1%	8	0.0%
OTHER				
900.100 OTHER, NOT INHERITED	52	0.4%	4	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	552	4.1%	556	2.8%
NORMAL				
.000 NORMAL GLOBE	8,844	65.2%	13,840	69.9%

POODLE

(Unspecified variety)

*Up until 2022, the toy/miniature/standard poodle conditions were assessed as a group, therefore statistics prior to this date may not reflect the real incidence within the breed subgroups. From 2021, the Standard Poodle is assessed separately from the Toy & Miniature varieties, and conditions may be added or removed from each page as statistics start to be generated.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1, 2-4	NO	
E.	Y-suture tip opacity	Not defined	1	Breeder option	
F.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1, 10-20	NO	Mutation in the *prcd* gene
	- rod-cone dysplasia type 4 (*rcd4*)	Autosomal recessive	5-9	NO	Mutation in the *C2orf71* gene *only in Standards & Miniatures
H.	Day blindness/retinal degeneration	Autosomal recessive	1	NO	Mutation has not been published *only in Standards
I.	Micropapilla	Not defined	1	Breeder option	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence [illegible] ded; breeding discretion is

advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

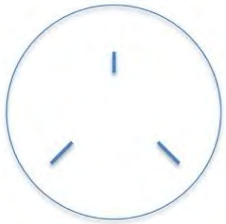
D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The Poodle cataract can involve the lens cortex and lens nucleus. The rate and degree of progression are variable. A familial form of cataract has been described in the Standard Poodle, beginning with an equatorial opacity initially observed in dogs prior to 2 years of age.

E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

F. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment and/or glaucoma. Either condition may cause blindness.

G. Retinal atrophy

- prcd

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that PRA in the Poodle is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available. It is important to note that in all breeds in which a molecular diagnostic test for the disease is available, it is possible to have dogs diagnosed clinically as affected, yet the DNA test results are normal. This suggests that other genetic causes of PRA exist or that the diagnosed affected dog has an acquired disease that mimics the inherited disorder.

- rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

H. Cone degeneration: Day Blindness/Retinal degeneration:

An autosomal recessive disorder of standard poodles and ‘Doodles’ (where the mix-bred dogs are backcrossed to standard poodles that carry the genetic defect); the disease also has been referred to as achromatopsia. The salient clinical findings is profound visual difficulty in bright light, day blindness, with subjective normal night vision. In the early stages of the disease, fundus examination is normal with some dogs showing focal hyperreflectivity of the cone-rich fovea like region of the retina; the photopic ERG is not recordable. In some older dogs, there is progression resulting in poor/absent vision under both dim and bright light conditions, markedly abnormal or non-recordable ERG, and a fundus appearance indicative of late stage retinal degeneration and indistinguishable from progressive retinal atrophy.

I. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Rubin LF, Flowers RD. Inherited cataract in a family of Standard Poodles. *J Am Vet Med Assoc*. 1972;161:207-208.

3. Barnett KC, Startup FG. Hereditary cataract in the standard poodle. *Vet Rec*. 1985;117:15-16.

4. Gelatt KN, Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol*. 2005;8:101-111.

5. Barnett KC. Canine retinopathies III. The other breeds. *J Small Anim Pract*. 1965;6:185-196.

6. Barnett KC. Hereditary retinal atrophy in the Poodle. *Vet Rec*. 1962;74:672-675.

7. Aguirre G, Alligood J, O'Brien P, et al. Pathogenesis of progressive rod-cone degeneration in Miniature Poodles. *Invest Ophthalmol Vis Sci*. 1982;23:610-630.

8. Barnett KC. Two forms of hereditary and progressive retinal atrophy in the dog. I. The Miniature Poodle. II. The Labrador retriever. *J Am Anim Hosp Assoc*. 1965:234-245.

9. Aguirre GD, Rubin LF. Progressive retinal atrophy in the Miniature Poodle: an electrophysiologic study. *J Am Vet Med Assoc*. 1972;160:191-201.

10. Aguirre GD, al e. Hereditary retinal degeneration in the dog: Specificity of abnormal cyclic nucleotide metabolism to diseases of arrested photoreceptor development. *Birth Defects*. 1982;18:119-134.

11. Parkes JH, Aguirre G, Rockey JH, et al. Progressive rod-cone degeneration in the dog: characterization of the visual pigment. *Invest Ophthalmol Vis Sci*. 1982;23:674-678.

12. Sandberg MA, Pawlyk BS, Berson EL. Full-field electroretinograms in Miniature Poodles with progressive rod-cone degeneration. *Invest Ophthalmol Vis Sci*. 1986;27:1179-1184.

13. Aguirre G, O'Brien P. Morphological and biochemical studies of canine progressive rod-cone degeneration. 3H-fucose autoradiography. *Invest Ophthalmol Vis Sci*. 1986;27:635-655.

14. Aguirre GD, Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. *Exp Eye Res*. 1988;46:663-687.

15. Ray K, Acland GM, Aguirre GD. Nonallelism of erd and prcd and exclusion of the canine RDS/peripherin gene as a candidate for both retinal degeneration loci. *Invest Ophthalmol Vis Sci*. 1996;37:783-794.

16. Alvarez RA, Aguirre GD, Acland GM, et al. Docosapentaenoic acid is converted to docosahexaenoic acid in the retinas of normal and prcd-affected miniature poodle dogs. *Invest Ophthalmol Vis Sci*. 1994;35:402-408.

17. Kemp CM, Jacobson SG. Rhodopsin levels in the central retinas of normal Miniature Poodles and those with progressive rod-cone degeneration. *Exp Eye Res*. 1992;54:947-956.

18. Wetzel MG, Fahlman C, Maude MB, et al. Fatty acid metabolism in normal Miniature Poodles and those affected with progressive rod-cone degeneration (prcd). *Prog Clin Biol Res*. 1989;314:427-439.

19. Gaiddon J, Lallemeal PE, Peiffer RL, Jr. Positive correlation between coat color and electroretinographically diagnosed progressive retinal atrophy in Miniature Poodles in southern France. *Prog Vet Comp Ophthal*. 1995;5:74-77.

20. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

OCULAR DISORDERS REPORT
POODLE, UNSPECIFIED VARIETY

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 172,796 #	%	2018-2022 6,596 #	%
GLOBE				
.110 MICROPHTHALMIA	80	0.0%	16	0.2%
10.000 GLAUCOMA	20	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	4	0.1%
EYELIDS				
20.110 EYELID DERMOID	4	0.0%	0	0.0%
20.140 ECTOPIC CILIA	136	0.1%	4	0.1%
20.160 MACROPALPEBRAL FISSURE	4	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	448	0.3%	20	0.3%
22.000 ECTROPION, UNSPECIFIED	20	0.0%	0	0.0%
25.110 DISTICHIASIS	10,996	6.4%	184	2.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	8	0.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	8	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	32	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	124	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	72	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	156	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS	100	0.1%	8	0.1%
70.700 CORNEAL DYSTROPHY	976	0.6%	24	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	32	0.0%	0	0.0%
UVEA				
90.250 PIGMENTARY UVEITIS	8	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA	4	0.0%	8	0.1%
93.120 IRIS CYST	28	0.0%	4	0.1%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	20	0.0%	0	0.0%
93.150 IRIS COLOBOMA	20	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	0	0.0%	4	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	5,012	2.9%	420	6.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	304	0.2%	4	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	120	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	156	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	300	0.2%	160	2.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	12	0.0%	0	0.0%
93.810 UVEAL MELANOMA	4	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	0	0.0%	4	0.1%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	12	0.0%	0	0.0%
97.120 COLOBOMA	44	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	4	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	4	0.1%
130.110 MICROPAPILLA	0	0.0%	20	0.3%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	12	0.2%
LENS				
100.200 CATARACT, UNSPECIFIED	1,536	0.9%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8,928	5.2%	156	2.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1,656	1.0%	68	1.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	716	0.4%	8	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	464	0.3%	12	0.2%

OCULAR DISORDERS REPORT
POODLE, UNSPECIFIED VARIETY

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 172,796 #	 %	2018-2022 6,596 #	 %
LENS Continued				
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	196	0.1%	20	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	432	0.3%	56	0.8%
100.306 PUNCTATE CATARACT, NUCLEUS	140	0.1%	16	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR	164	0.1%	60	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1,800	1.0%	44	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1,508	0.9%	36	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	956	0.6%	20	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	140	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	332	0.2%	16	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS	248	0.1%	12	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	136	0.1%	28	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	8	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	12	0.0%	16	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	12	0.0%	0	0.0%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	4	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	4	0.1%
100.328 Y-SUTURE TIP OPACITIES	20	0.0%	60	0.9%
100.330 GENERALIZED/ COMPLETE CATARACT	1,672	1.0%	12	0.2%
100.340 RESORBING/ HYPERMATURE CATARACT	4	0.0%	4	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	104	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***12,124***	***7.0%***	***444***	***6.7%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	232	0.1%	36	0.5%
110.135 PHPV/ PTVL	88	0.1%	8	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	128	0.1%	4	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	1,052	0.6%	28	0.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	472	0.3%	8	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	80	0.0%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	36	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2,300	1.3%	12	0.2%
120.400 RETINAL HEMORRHAGE	12	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	108	0.1%	0	0.0%
120.960 RETINOPATHY	16	0.0%	8	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	456	0.3%	8	0.1%
130.120 OPTIC NERVE HYPOPLASIA	768	0.4%	16	0.2%
130.150 OPTIC DISC COLOBOMA	192	0.1%	8	0.1%
OTHER				
900.000 OTHER, UNSPECIFIED	1,732	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	3,500	2.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	888	0.5%	256	3.9%
NORMAL				
.000 NORMAL GLOBE	141,264	81.8%	5,148	78.0%

PORCELAINE HOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the PORCELAINE HOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
PORCELAINE HOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 14 #	%	2018-2022 35 #	%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	2.9%
NORMAL				
.000 NORMAL GLOBE	14	100.0%	34	97.1%

PORTUGUESE PODENGO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the PORTUGUESE PODENGO breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
PORTUGUESE PODENGO

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 49 #	 %	2018-2022 8 #	 %
EYELIDS				
20.140 ECTOPIC CILIA	1	2.0%	0	0.0%
25.110 DISTICHIASIS	1	2.0%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3	6.1%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.1%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	2.0%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	12.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	12.5%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***2.0%***	***2***	***25.0%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	2.0%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	2.0%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	25.0%
120.960 RETINOPATHY	1	2.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	2.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.1%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	43	87.8%	5	62.5%

PORTUGUESE PODENGO PEQUENO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Retinal atrophy				
	- rod-cone dysplasia type 3 (*rcd3*)	Autosomal recessive	1	NO	Mutation in the *PDE6A* gene
	- (*prcd*)	Autosomal recessive	2	NO	Mutation in the *prcd* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataracts

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Retinal atrophy

- rod-cone dysplasia type 3 (*rcd3*)

PRA in the Protuguese Podengo Pequeno is an autosomal recessive trait caused by a one base pair deletion in the gene encoding the alpha subunit of cyclic GMP phosphodiesterase (rcd3). PRA begins early in life with clinical signs of night blindness and a lack of rod ERG responses is seen at 6-8 weeks of

age. Dogs are completely blind by 2-3 years of age when ophthalmoscopic signs are first visible. The mutation is found in the *PDE6A* gene. A DNA test is available.

- prcd

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Other forms of retinal degeneration that are not *prcd* are recognized in the Portuguese Podengo Pequeno. The currently available genetic test will not detect these other forms of PRA.

References

1. ACVO Genetics Committee and Data from OFA All-Breeds Report.

2. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

3. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
PORTUGUESE PODENGO PEQUENO

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 263 #	 %	Year Examined: 2018-2022 Total # Dogs: 194 #	 %
EYELIDS					
20.140	ECTOPIC CILIA	0	0.0%	1	0.5%
25.110	DISTICHIASIS	13	4.9%	14	7.2%
CORNEA					
70.700	CORNEAL DYSTROPHY	1	0.4%	4	2.1%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	12	4.6%	11	5.7%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.4%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	2	1.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	3.0%	9	4.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.8%	2	1.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.4%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	5	1.9%	3	1.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.4%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.4%	1	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.8%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.4%	1	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	5	1.9%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	2	0.8%	1	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.4%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.4%	1	0.5%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	5	2.6%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.4%	0	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.5%
100.328	Y-SUTURE TIP OPACITIES	1	0.4%	3	1.5%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.4%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.4%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	1.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***25***	***9.5%***	***15***	***7.7%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.8%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	5	1.9%	1	0.5%
110.320	VITREOUS DEGENERATION SYNERESIS	11	4.2%	1	0.5%
RETINA					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.5%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	1.9%	0	0.0%
120.960	RETINOPATHY	3	1.1%	0	0.0%
OTHER					
900.100	OTHER, NOT INHERITED	0	0.0%	1	0.5%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	3.0%	6	3.1%
NORMAL					
.000	NORMAL GLOBE	199	75.7%	146	75.3%

PORTUGUESE POINTER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the PORTUGUESE POINTER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
PORTUGUESE POINTER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	11		0	
	Diagnostic Name	**#**	**%**	**#**	**%**
LENS					
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1	9.1%	0	
100.316	INCIPIENT CATARACT, NUCLEUS	1	9.1%	0	
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***2***	***18.2%***	***0***	
NORMAL					
.000	NORMAL GLOBE	9	81.8%	0	

PORTUGUESE WATER DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia with multiple ocular defects	Autosomal recessive	1-3	NO	Mutation is not yet published
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
E.	Cataract	Not defined	1	NO	
F	Y-suture tip opacities	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- early onset	Autosomal recessive	4	NO	Mutation in the *CCDC66* gene
	- *prcd*	Autosomal recessive	5	NO	Mutation in the *prcd* gene
H.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Microphthalmia with multiple congenital ocular defects

This is a congenital abnormality present bilaterally and characterized by a small globe and associated ocular defects which can affect the cornea, anterior chamber, lens and/or retina. These associated defects may be variable in severity. Several cases have been identified, all of which appeared to have a common ancestry. All affected animals so far identified have been the progeny of dogs that were phenotypically normal, suggesting that the defect is not dominantly inherited.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

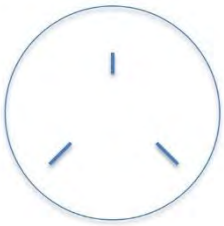
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

G. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Studies have shown that the principal form of PRA in the Portuguese Water Dog is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

- early onset

A second, earlier onset form of PRA has also been identified recently in the Portuguese Water Dog. The onset of visual deficits occurs at 2-3 years of age, and, dogs show advanced retinal degeneration at the time visual deficits are recognized. The condition appears inherited as autosomal recessive. A DNA test is available.

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Case records (1986-1994), Section of Medical Genetics, School of Veterinary Medicine, University of Pennsylvania.

3. Shaw, G. C., et al. (2019). "Microphthalmia With Multiple Anterior Segment Defects in Portuguese Water Dogs." Vet Pathol 56(2): 269-273. PMID: 30131012

4. Murgiano L, Becker D, Spector C, Carlin K, Santana E, Niggel JK, Jagannathan V, Leeb T, Pearce-Kelling S, Aguirre GD, Miyadera K. CCDC66 frameshift variant associated with a new form of early-onset progressive retinal atrophy in Portuguese Water Dogs. Sci Rep. 2020 Dec 3;10(1):21162. doi: 10.1038/s41598-020-77980-5. PMID: 33273526; PMCID: PMC7712861.

5. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*.

2006;88:551-563. Epub 2006/08/30. PMID: 16938425

OCULAR DISORDERS REPORT
PORTUGUESE WATER DOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	32,648		8,001	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	20	0.1%	13	0.2%
10.000	GLAUCOMA	6	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	3	0.0%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	61	0.2%	16	0.2%
22.000	ECTROPION, UNSPECIFIED	3	0.0%	0	0.0%
25.110	DISTICHIASIS	1,184	3.6%	251	3.1%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.0%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	6	0.0%	5	0.1%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	4	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	5	0.0%	3	0.0%
70.700	CORNEAL DYSTROPHY	251	0.8%	128	1.6%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	6	0.0%	1	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	2	0.0%	6	0.1%
93.120	IRIS CYST	10	0.0%	2	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	2	0.0%	0	0.0%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	2	0.0%	0	0.0%
93.180	IIRIS SPHINCTER DYSPLASIA	0	0.0%	1	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	2,039	6.2%	644	8.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	42	0.1%	18	0.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	34	0.1%	3	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	43	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	58	0.2%	48	0.6%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	10	0.0%	3	0.0%
93.810	UVEAL MELANOMA	6	0.0%	3	0.0%
95.120	CILIARY BODY CYST	1	0.0%	0	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	2	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	21	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.0%
120.960	RETINOPATHY	0	0.0%	1	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	69	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2,150	6.6%	505	6.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	583	1.8%	315	3.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	124	0.4%	54	0.7%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	85	0.3%	33	0.4%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	57	0.2%	22	0.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	99	0.3%	35	0.4%
100.306	PUNCTATE CATARACT, NUCLEUS	32	0.1%	13	0.2%
100.307	PUNCTATE CATARACT, CAPSULAR	91	0.3%	68	0.8%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	140	0.4%	47	0.6%

OCULAR DISORDERS REPORT
PORTUGUESE WATER DOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 32,648 #	%	2018-2022 8,001 #	%
LENS Continued				
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	101	0.3%	23	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	108	0.3%	33	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	15	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	20	0.1%	6	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	28	0.1%	5	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	29	0.1%	16	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	15	0.0%	9	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	14	0.0%	7	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	8	0.1%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	3	0.0%	1	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	66	0.2%	67	0.8%
100.330 GENERALIZED/ COMPLETE CATARACT	74	0.2%	8	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	3	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	11	0.0%	3	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,696***	***5.2%***	***703***	***8.8%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	48	0.1%	21	0.3%
110.135 PHPV/ PTVL	18	0.1%	2	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	6	0.0%	10	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	42	0.1%	13	0.2%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	270	0.8%	46	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	19	0.1%	1	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	177	0.5%	1	0.0%
120.400 RETINAL HEMORRHAGE	8	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	3	0.0%	0	0.0%
120.960 RETINOPATHY	2	0.0%	4	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	16	0.0%	4	0.0%
130.120 OPTIC NERVE HYPOPLASIA	11	0.0%	1	0.0%
130.150 OPTIC DISC COLOBOMA	6	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	313	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	538	1.6%	2	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	424	1.3%	270	3.4%
NORMAL				
.000 NORMAL GLOBE	27,153	83.2%	6,081	76.0%

PUDELPOINTER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the PUDELPOINTER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
PUDELPOINTER

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	4		5	
Diagnostic Name	**#**	**%**	**#**	**%**
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	25.0%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	3	75.0%	5	100.0%

PUG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Pigmentary Keratitis/Pigmentary Keratopathy	Not defined	1-3	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
E.	Cataract	Not defined	1, 4	NO
F.	Vitreous degeneration			
	- syneresis	Not defined	1	Breeder option

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the Pug, entropion usually involves the medial canthal margin of the lower eyelid(s).

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Pigmentary keratitis/keratopathy

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

The breed standard indicates the Pug should have a "large massive round head with very large, bold and prominent eyes." These characteristics give rise to the ocular exposure and irritative problems common in the breed.

Pigmentary keratopathy is a condition reported in Pugs in which the cornea becomes pigmented, often resulting in vision impairment. Development of pigmentary keratopathy is associated in some studies with low tear production (STT) and medial eyelid entropion.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally in the neonatal period. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Vitreous degeneration - syneresis

Liquefaction of the vitreous gel which may predispose to retinal detachment.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Labelle AL, Dresser CB, Hamor RE, et al. Characteristics of, prevalence of, and risk factors for corneal pigmentation (pigmentary keratopathy) in Pugs. *J Am Vet Med Assoc*. 2013;243:667-674.

3. Maini, S., et al. (2019). "Pigmentary keratitis in pugs in the United Kingdom: prevalence and associated features." BMC Vet Res 15(1): 384. PMID: 31666065

4. Gelatt KN, Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol*. 2005;8:101-111.

OCULAR DISORDERS REPORT
PUG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,826 #	 %	2018-2022 908 #	 %
GLOBE				
.110 MICROPHTHALMIA	3	0.1%	0	0.0%
EYELIDS				
20.110 EYELID DERMOID	1	0.0%	0	0.0%
20.140 ECTOPIC CILIA	15	0.5%	4	0.4%
20.160 MACROPALPEBRAL FISSURE	67	2.4%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	506	17.9%	134	14.8%
22.000 ECTROPION, UNSPECIFIED	11	0.4%	0	0.0%
25.110 DISTICHIASIS	249	8.8%	52	5.7%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA	8	0.3%	1	0.1%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	1	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	80	2.8%	0	0.0%
70.220 PIGMENTARY KERATITIS	918	32.5%	412	45.4%
70.700 CORNEAL DYSTROPHY	14	0.5%	1	0.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	4	0.1%	0	0.0%
UVEA				
90.250 PIGMENTARY UVEITIS	1	0.0%	1	0.1%
93.120 IRIS CYST	1	0.0%	0	0.0%
93.150 IRIS COLOBOMA	3	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	301	10.7%	105	11.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	8	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	16	0.6%	2	0.2%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	9	0.3%	1	0.1%
FUNDUS				
97.120 COLOBOMA	1	0.0%	0	0.0%
130.110 MICROPAPILLA	0	0.0%	2	0.2%
LENS				
100.200 CATARACT, UNSPECIFIED	4	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	60	2.1%	9	1.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	14	0.5%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	6	0.2%	2	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	8	0.3%	2	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS	10	0.4%	3	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR	5	0.2%	3	0.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	20	0.7%	3	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	18	0.6%	3	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	8	0.3%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	8	0.3%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	4	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	7	0.2%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.1%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.1%	1	0.1%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%

OCULAR DISORDERS REPORT
PUG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,826 #	 %	Year Examined: 2018-2022 Total # Dogs: 908 #	 %
LENS Continued				
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	2	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	2	0.2%
100.330 GENERALIZED/ COMPLETE CATARACT	13	0.5%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***143***	***5.1%***	***19***	***2.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	16	0.6%	2	0.2%
110.135 PHPV/ PTVL	3	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	27	1.0%	4	0.4%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	20	0.7%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	12	0.4%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.1%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	36	1.3%	0	0.0%
900.100 OTHER, NOT INHERITED	165	5.8%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	113	4.0%	41	4.5%
NORMAL				
.000 NORMAL GLOBE	1,130	40.0%	350	38.5%

PULI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens foci / no strands	Not defined	1	Passes with no notation	
B.	Cataract	Not defined	1	NO	
C.	Retinal atrophy (*prcd*)	Autosomal recessive	2	NO	Mutation in the *prcd* gene
D.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Puli is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*)

gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

OCULAR DISORDERS REPORT
PULI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,154 #	 %	2018-2022 161 #	 %
EYELIDS				
20.110 EYELID DERMOID	1	0.1%	0	0.0%
20.140 ECTOPIC CILIA	1	0.1%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	1	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	8	0.7%	0	0.0%
25.110 DISTICHIASIS	7	0.6%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	5	0.4%	0	0.0%
70.700 CORNEAL DYSTROPHY	18	1.6%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	265	23.0%	21	13.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	14	1.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	8	0.7%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	7	0.6%	5	3.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	3	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	67	5.8%	5	3.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	8	0.7%	6	3.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.3%	2	1.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.6%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	12	1.0%	2	1.2%
100.306 PUNCTATE CATARACT, NUCLEUS	5	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	4	0.3%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	10	0.9%	3	1.9%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	4	0.3%	3	1.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.6%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	3	0.3%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.6%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.2%	1	0.6%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.6%
100.328 Y-SUTURE TIP OPACITIES	3	0.3%	2	1.2%
100.330 GENERALIZED/ COMPLETE CATARACT	7	0.6%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***70***	***6.1%***	***20***	***12.4%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	0.2%	1	0.6%
110.135 PHPV/ PTVL	1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	1	0.1%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	49	4.2%	2	1.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	3	0.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	4	0.3%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.2%	0	0.0%

OCULAR DISORDERS REPORT
PULI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,154 #	 %	Year Examined: 2018-2022 Total # Dogs: 161 #	 %
OPTIC NERVE				
130.110 MICROPAPILLA	2	0.2%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	3	0.3%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	13	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	46	4.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	0.7%	6	3.7%
NORMAL				
.000 NORMAL GLOBE	772	66.9%	117	72.7%

PUMI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
PUMI

Diagnostic Name	1993-2017 #	1993-2017 %	2018-2022 #	2018-2022 %
Year Examined:	**1993-2017**		**2018-2022**	
Total # Dogs:	**112**		**60**	
CORNEA				
70.700 CORNEAL DYSTROPHY	1	0.9%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	6	5.4%	4	6.7%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	2.7%	1	1.7%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	4.5%	1	1.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.9%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.9%	2	3.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.9%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***3***	***2.7%***	***2***	***3.3%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	1.8%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	0	0.0%	1	1.7%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	1.8%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	0.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	1.8%	2	3.3%
NORMAL				
.000 NORMAL GLOBE	101	90.2%	52	86.7%

PYRENEAN MASTIFF

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
PYRENEAN MASTIFF

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 5 #	 %	Year Examined: 2018-2022 Total # Dogs: 16 #	 %
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	1	20.0%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	2	40.0%	1	6.3%
25.110	DISTICHIASIS	1	20.0%	1	6.3%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	20.0%	6	37.5%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	2	12.5%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	3	18.8%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***0***	***0.0%***	***3***	***18.8%***
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	20.0%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	0	0.0%	8	50.0%

PYRENEAN SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Choroidal hypoplasia	Not defined	1	NO
D.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Choroidal hypoplasia

Inadequate development of the choroid present at birth and non-progressive. This condition is more commonly identified in the Collie breed where it is a manifestation of "Collie Eye Anomaly."

D. Retinal dysplasia – folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
PYRENEAN SHEPHERD

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	531		266	
Diagnostic Name	**#**	**%**	**#**	**%**
GLOBE				
.110 MICROPHTHALMIA	0	0.0%	2	0.8%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	0	0.0%	1	0.4%
25.110 DISTICHIASIS	1	0.2%	1	0.4%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.2%	1	0.4%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.2%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	2	0.4%	2	0.8%
UVEA				
93.110 IRIS HYPOPLASIA	1	0.2%	2	0.8%
93.150 IRIS COLOBOMA	1	0.2%	1	0.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	26	4.9%	7	2.6%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.2%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	20	3.8%	6	2.3%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	13	2.4%	5	1.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	5	0.9%	1	0.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.6%	1	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	5	0.9%	3	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.2%	1	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.4%	1	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	8	1.5%	1	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.8%	2	0.8%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.4%
100.326 INCOMPLETE CATARACT, NUCLEUS	2	0.4%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES	1	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.2%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***35***	***6.6%***	***13***	***4.9%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	5	0.9%	3	1.1%
110.135 PHPV/ PTVL	0	0.0%	5	1.9%
110.320 VITREOUS DEGENERATION SYNERESIS	1	0.2%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	10	1.9%	5	1.9%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.2%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.4%
OPTIC NERVE				
130.110 MICROPAPILLA	0	0.0%	2	0.8%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.4%
OTHER				
900.000 OTHER, UNSPECIFIED	9	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED	11	2.1%	0	0.0%

OCULAR DISORDERS REPORT
PYRENEAN SHEPHERD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 531 #	 %	Year Examined: 2018-2022 Total # Dogs: 266 #	 %
OTHER Continued				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	11	2.1%	13	4.9%
NORMAL				
.000 NORMAL GLOBE	442	83.2%	216	81.2%

RAT TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1, 2	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

1. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010;51:4716-4721.

2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384.

OCULAR DISORDERS REPORT
RAT TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 311 #	 %	2018-2022 76 #	 %
EYELIDS				
25.110 DISTICHIASIS	5	1.6%	2	2.6%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	12	3.9%	2	2.6%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.6%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	1.6%	1	1.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.6%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.3%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	3	1.0%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	3	1.0%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.6%	1	1.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.3%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	1	0.3%	1	1.3%
100.330 GENERALIZED/ COMPLETE CATARACT	5	1.6%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	6	1.9%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***19***	***6.1%***	***1***	***1.3%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.6%	1	1.3%
110.320 VITREOUS DEGENERATION SYNERESIS	3	1.0%	0	0.0%
RETINA				
120.190 RETINAL DYSPLASIA, DETACHED	2	0.6%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.3%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	3	1.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	1.0%	1	1.3%
NORMAL				
.000 NORMAL GLOBE	274	88.1%	68	89.5%

REDBONE COONHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the REDBONE COONHOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
REDBONE COONHOUND

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 38 #	 %	Year Examined: 2018-2022 Total # Dogs: 31 #	 %
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	0	0.0%	2	6.5%
25.110	DISTICHIASIS	1	2.6%	0	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	0	0.0%	1	3.2%
UVEA					
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	2.6%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	2.6%	1	3.2%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	2.6%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	3.2%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***1***	***2.6%***	***1***	***3.2%***
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	3.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	2.6%	0	0.0%
120.960	RETINOPATHY	1	2.6%	0	0.0%
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	2.6%	1	3.2%
NORMAL					
.000	NORMAL GLOBE	34	89.5%	25	80.6%

RHODESIAN RIDGEBACK

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	2	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Y-suture tip opacity	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

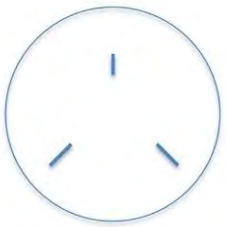
D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may

involve the lens completely (diffuse) or in a localized region.

E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Breed club request to ACVO Genetics Committee, 2008.

OCULAR DISORDERS REPORT
RHODESIAN RIDGEBACK

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	5,042		1,563	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	2	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	0	0.0%	1	0.1%
21.000	ENTROPION, UNSPECIFIED	15	0.3%	4	0.3%
22.000	ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110	DISTICHIASIS	141	2.8%	35	2.2%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	5	0.1%	4	0.3%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	3	0.1%	0	0.0%
CORNEA					
70.210	PANNUS	6	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	27	0.5%	12	0.8%
UVEA					
93.110	IRIS HYPOPLASIA	1	0.0%	0	0.0%
93.120	IRIS CYST	5	0.1%	1	0.1%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	4	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	299	5.9%	69	4.4%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	7	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.0%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	83	1.6%	76	4.9%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.1%	0	0.0%
93.810	UVEAL MELANOMA	3	0.1%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	1	0.1%
LENS					
100.200	CATARACT, UNSPECIFIED	4	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	238	4.7%	49	3.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	22	0.4%	5	0.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	58	1.2%	17	1.1%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	7	0.1%	2	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.0%	3	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	46	0.9%	12	0.8%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	2	0.1%
100.307	PUNCTATE CATARACT, CAPSULAR	29	0.6%	19	1.2%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	10	0.2%	3	0.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	93	1.8%	25	1.6%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	13	0.3%	7	0.4%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	18	0.4%	3	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	6	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	25	0.5%	9	0.6%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	4	0.3%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.1%	7	0.4%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	2	0.1%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	2	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	22	0.4%	22	1.4%
100.330	GENERALIZED/ COMPLETE CATARACT	3	0.1%	1	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.1%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***342***	***6.8%***	***124***	***7.9%***

OCULAR DISORDERS REPORT
RHODESIAN RIDGEBACK

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 5,042 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,563 #	 %
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	4	0.1%	9	0.6%
110.135 PHPV/ PTVL	1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	8	0.2%	2	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS	8	0.2%	2	0.1%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	7	0.1%	3	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.0%	1	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	0.1%	2	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.0%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	5	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	51	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	92	1.8%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	67	1.3%	28	1.8%
NORMAL				
.000 NORMAL GLOBE	4,179	82.9%	1,236	79.1%

ROTTWEILER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A	Entropion	Not defined	3	NO
B.	Uveal cysts			
	-iris cyst	Not defined	1	Breeder option
	-anterior chamber cyst	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Retinal atrophy			
	- generalized	Not defined	1, 2	NO

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Uveal cysts

A pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions is various breeds.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

A variety of cataracts have been observed in this breed ranging from the posterior polar cataract similar to that in the Golden Retriever and cataracts involving multiple areas of the nucleus and cortex. Further studies need to be performed as to the exact mode of inheritance, but it is our recommendation that the individually afflicted dog should not be bred.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Bjerkas E. Progressive retinal atrophy in dogs in Norway. *Norsk Veterinaertidsskrift.* 1991;103:601-610. **reference derived from non-USA dog population**

3. Breed club request to ACVO genetics committee, 2022

OCULAR DISORDERS REPORT
ROTTWEILER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 15,980 #	%	2018-2022 2,943 #	%
GLOBE				
.110 MICROPHTHALMIA	3	0.0%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	10	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	128	0.8%	20	0.7%
22.000 ECTROPION, UNSPECIFIED	30	0.2%	2	0.1%
25.110 DISTICHIASIS	95	0.6%	13	0.4%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	3	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	4	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	16	0.1%	1	0.0%
CORNEA				
70.210 PANNUS	3	0.0%	1	0.0%
70.220 PIGMENTARY KERATITIS	2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	150	0.9%	22	0.7%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	7	0.0%	1	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	12	0.1%	6	0.2%
93.120 IRIS CYST	257	1.6%	85	2.9%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150 IRIS COLOBOMA	55	0.3%	9	0.3%
93.170 ANTERIOR CHAMBER CYST	33	0.2%	48	1.6%
93.180 IRIS SPHINCTER DYSPLASIA	0	0.0%	1	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	126	0.8%	24	0.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	39	0.2%	8	0.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	55	0.3%	11	0.4%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	8	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	176	1.1%	138	4.7%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	14	0.1%	6	0.2%
93.810 UVEAL MELANOMA	3	0.0%	2	0.1%
95.120 CILIARY BODY CYST	19	0.1%	8	0.3%
LENS				
100.200 CATARACT, UNSPECIFIED	229	1.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	960	6.0%	207	7.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	216	1.4%	156	5.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	304	1.9%	44	1.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	13	0.1%	5	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	26	0.2%	10	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	97	0.6%	11	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS	46	0.3%	24	0.8%
100.307 PUNCTATE CATARACT, CAPSULAR	94	0.6%	49	1.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	130	0.8%	38	1.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	558	3.5%	98	3.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	42	0.3%	10	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	13	0.1%	4	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	81	0.5%	13	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS	61	0.4%	7	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	50	0.3%	20	0.7%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	7	0.0%	2	0.1%

OCULAR DISORDERS REPORT
ROTTWEILER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 15,980 #	 %	Year Examined: 2018-2022 Total # Dogs: 2,943 #	 %
LENS Continued				
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	12	0.1%	7	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	2	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	4	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	4	0.0%	2	0.1%
100.328 Y-SUTURE TIP OPACITIES	22	0.1%	14	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT	49	0.3%	2	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***2,035***	***12.7%***	***509***	***17.3%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	28	0.2%	7	0.2%
110.135 PHPV/ PTVL	8	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	11	0.1%	6	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS	60	0.4%	10	0.3%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	4	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	4	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
120.960 RETINOPATHY	0	0.0%	3	0.1%
120.970 CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.0%
130.110 MICROPAPILLA	0	0.0%	1	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	136	0.9%	15	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	48	0.3%	6	0.2%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	181	1.1%	2	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	23	0.1%	7	0.2%
OPTIC NERVE				
130.110 MICROPAPILLA	17	0.1%	2	0.1%
130.120 OPTIC NERVE HYPOPLASIA	17	0.1%	1	0.0%
130.150 OPTIC DISC COLOBOMA	2	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	137	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	336	2.1%	3	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	301	1.9%	160	5.4%
NORMAL				
.000 NORMAL GLOBE	12,577	78.7%	2,031	69.0%

RUSSELL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Lens luxation	Autosomal recessive	2	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011; 14: 378-384.

OCULAR DISORDERS REPORT
RUSSELL TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	432		247	
	Diagnostic Name	**#**	**%**	**#**	**%**
EYELIDS					
25.110	DISTICHIASIS	14	3.2%	8	3.2%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.2%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.2%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	1	0.2%	1	0.4%
UVEA					
93.120	IRIS CYST	1	0.2%	0	0.0%
93.150	IRIS COLOBOMA	1	0.2%	0	0.0%
93.180	IIRIS SPHINCTER DYSPLASIA	1	0.2%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	18	4.2%	19	7.7%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	0	0.0%	1	0.4%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.5%	1	0.4%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	19	4.4%	18	7.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	13	3.0%	4	1.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.5%	1	0.4%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.5%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	5	1.2%	4	1.6%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	4	1.6%
100.307	PUNCTATE CATARACT, CAPSULAR	0	0.0%	5	2.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	3	1.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.4%
100.317	INCIPIENT CATARACT, CAPSULAR	0	0.0%	1	0.4%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.2%	1	0.4%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.7%	2	0.8%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.4%
100.328	Y-SUTURE TIP OPACITIES	1	0.2%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***27***	***6.3%***	***27***	***10.9%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.2%	2	0.8%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	1	0.4%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	2	0.5%	1	0.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.2%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.2%	0	0.0%
FUNDUS					
130.110	MICROPAPILLA	0	0.0%	1	0.4%
OPTIC NERVE					
130.110	MICROPAPILLA	1	0.2%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	2	0.5%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	15	3.5%	13	5.3%
NORMAL					
.000	NORMAL GLOBE	365	84.5%	182	73.7%

RUSSIAN TOY

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
RUSSIAN TOY

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 70 #	 %	2018-2022 102 #	 %
EYELIDS				
25.110 DISTICHIASIS	1	1.4%	1	1.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	1.4%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	5	7.1%	7	6.9%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	7.1%	10	9.8%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	1.4%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	1	1.4%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	4.3%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	3	4.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	1.4%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	2.9%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	1	1.4%	1	1.0%
100.328 Y-SUTURE TIP OPACITIES	1	1.4%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***7***	***10.0%***	***1***	***1.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	1.4%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	5.7%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	3	4.3%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	1.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	1.0%
RETINA				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	1.0%
120.190 RETINAL DYSPLASIA, DETACHED	0	0.0%	1	1.0%
120.960 RETINOPATHY	1	1.4%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	2	2.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	4.3%	2	2.0%
NORMAL				
.000 NORMAL GLOBE	50	71.4%	79	77.5%

Russian Tsvetnaya Bolonka
(Bolonka Zwetna)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC TEST
A.	Cataract	Not defined	1	NO	

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
RUSSIAN TSVETNAYA BOLONKA

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	109		26	
	Diagnostic Name	**#**	**%**	**#**	**%**
EYELIDS					
25.110	DISTICHIASIS	1	0.9%	0	0.0%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.9%	0	0.0%
CORNEA					
70.220	PIGMENTARY KERATITIS	2	1.8%	0	0.0%
UVEA					
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.9%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	4.6%	0	0.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.9%	2	7.7%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	2.8%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.9%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.9%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	3	2.8%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	0	0.0%	1	3.8%
100.328	Y-SUTURE TIP OPACITIES	5	4.6%	1	3.8%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.9%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***9***	***8.3%***	***3***	***11.5%***
VITREOUS					
110.135	PHPV/ PTVL	1	0.9%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	8	7.3%	2	7.7%
110.320	VITREOUS DEGENERATION SYNERESIS	8	7.3%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	1	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	2	1.8%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	1.8%	4	15.4%
NORMAL					
.000	NORMAL GLOBE	88	80.7%	17	65.4%

RUSSO-EUROPEAN LAIKA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma - POAG	Presumed autosomal recessive	2	NO	Mutation in the ADAMTS10 gene
B.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1, 2	NO	Mutation in the *prcd* gene

Description and Comments

A. Glaucoma

Glaucoma is an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

Primary open angle glaucoma is present in the breed, and extensive breeding studies have demonstrated its inheritance as autosomal recessive. By one year of age, the intraocular pressure (IOP) is elevated, but the filtration angle is open (early glaucoma). Animals with moderate glaucoma show sustained elevations of IOP, focal disinsertions of the lens zonules and focal closures of the iridocorneal angle. Later the globe enlarges, the lens luxates and the eyes become blind and show the effects of chronic glaucoma. The causative mutation in *ADAMTS10* causes an arginine for glycine substitution at position 661. A DNA test is available.

B. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Russo-European Laika is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary

ocular conditions of the Russo-European Laika. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
RUSSO-EUROPEAN LAIKA

There are no statistics available for this breed

SAINT BERNARD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Entropion	Not defined	1, 2	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Persistent pupillary membrane			
	- iris to iris	Not defined	1	Breeder option
E.	Cataract	Not defined	1	NO

Description and Comments

A. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In this breed, entropion is associated with an exceptionally large palpebral fissure.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Priester WA. Congenital ocular defects in cattle, horses, cats, and dogs. *J Am Vet Med Assoc*. 1972 Jun 1;160:1504-1511.

OCULAR DISORDERS REPORT
SAINT BERNARD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 277 #	 %	Year Examined: 2018-2022 Total # Dogs: 185 #	 %
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	21	7.6%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	73	26.4%	37	20.0%
22.000 ECTROPION, UNSPECIFIED	97	35.0%	36	19.5%
25.110 DISTICHIASIS	18	6.5%	7	3.8%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	0.4%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.4%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	1	0.4%	0	0.0%
70.700 CORNEAL DYSTROPHY	2	0.7%	0	0.0%
UVEA				
93.120 IRIS CYST	2	0.7%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	2	0.7%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	25	9.0%	14	7.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.4%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.7%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.4%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	14	5.1%	10	5.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.7%	5	2.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	3	1.1%	3	1.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.7%	2	1.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.4%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	2	0.7%	1	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.4%	1	0.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	5	1.8%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	5	1.8%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	6	2.2%	2	1.1%
100.316 INCIPIENT CATARACT, NUCLEUS	5	1.8%	1	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.4%	1	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.4%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.4%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.5%
100.328 Y-SUTURE TIP OPACITIES	1	0.4%	1	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT	9	3.2%	1	0.5%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***44***	***15.9%***	***18***	***9.7%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	3	1.1%	1	0.5%
110.135 PHPV/ PTVL	1	0.4%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	0	0.0%	1	0.5%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	5	1.8%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.4%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	1	0.4%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	3	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED	10	3.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	15	5.4%	6	3.2%

OCULAR DISORDERS REPORT
SAINT BERNARD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 277 #	%	Year Examined: 2018-2022 Total # Dogs: 185 #	%
NORMAL				
.000 NORMAL GLOBE	100	36.1%	100	54.1%

SALUKI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
SALUKI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 297 #	 %	2018-2022 80 #	 %
EYELIDS				
25.110 DISTICHIASIS	1	0.3%	6	7.5%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	0.3%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	7	2.4%	4	5.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	1.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.7%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.3%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	18	6.1%	6	7.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.3%	1	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	4	1.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.3%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.3%	1	1.3%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.3%	1	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR	3	1.0%	2	2.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.3%	1	1.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.7%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.3%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	0	0.0%	1	1.3%
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	4	5.0%
100.330 GENERALIZED/ COMPLETE CATARACT	2	0.7%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***17***	***5.7%***	***7***	***8.8%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	7	2.4%	3	3.8%
110.320 VITREOUS DEGENERATION SYNERESIS	2	0.7%	0	0.0%
RETINA				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2	0.7%	0	0.0%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	2	0.7%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	0.3%	0	0.0%
900.100 OTHER, NOT INHERITED	5	1.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	5	6.3%
NORMAL				
.000 NORMAL GLOBE	252	84.8%	60	75.0%

SAMOYED

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	1-7	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1, 8	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Retinal atrophy				
	- (*RPGR)*	X-linked recessive	1, 9, 10	NO	Mutation in the *RPGR* gene
G.	Retinal dysplasia (without skeletal defects)				
	- folds	Presumed autosomal recessive	1	NO (Breeder option requires Normal genetic test for mutation in COL9A2 gene)	Mutation in the *COL9A2* gene
H.	Retinal dysplasia (with skeletal defects)				
	- folds/geographic/ detached	Autosomal recessive with incomplete dominance for the eyes	1, 11-14	NO	Mutation in the *COL9A2* gene
I.	Uveodermatologic syndrome	Not defined	1, 15, 16	NO	

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Retinal atrophy - *RPGR*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In the Samoyed, one form of PRA, known as XLPRA1, is due to a mutation in the *RPGR* gene and is inherited as a recessive, sex-linked trait. A DNA test is available.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness.

In the Samoyed, the presence of retinal folds may be seen in the heterozygous state described in "I" below. Thus the recommendation against breeding. The breeding advice for Labrador Retrievers and Samoyeds diagnosed with "retinal dysplasia - folds" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog showing that it is not a carrier of the *COL9A2* mutation.

H. Retinal dysplasia - folds with skeletal defects in homozygous affected dogs

This condition is also known as oculo-skeletal dysplasia (OSD) or dwarfism with retinal dysplasia type 2 (DRD2) in the Samoyed. A similar condition, DRD1, occurs in the Labrador Retriever. The condition is autosomal recessive and homozygous affected dogs have shortened forelimbs ("downhill" conformation) with valgus deformity. They have severe ocular defects including cataract, retinal folds/multifocal retinal dysplasia, vitreal degeneration and retinal detachment. The ocular abnormalities result in blindness in most dogs. Heterozygous dogs can have either a normal ocular exam or have multiple retinal folds, vitreal membranes, or vitreal degeneration suggesting a semi-dominant mechanism with respect to the eyes. It is important to note that generally the retinal folds present in heterozygous dogs tend to cluster around the major superior blood vessels of the central tapetal region. The condition is caused by a 1,267 bp deletion of *COL9A2.* A DNA test is available.

I. Uveodermatologic syndrome

Uveodermatologic syndrome in the Samoyed bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. Adhesions between the iris and lens (posterior synechiae) and the peripheral iris and cornea (peripheral anterior synechiae) develop rapidly. Other complications include cataract development, retinal degeneration, retinal separation or detachment, optic disc atrophy and secondary glaucoma. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. Some veterinary ophthalmologists feel there is a prevalence of this entity in the Samoyed. Additional studies are needed to validate this experience and explore the possibility of a genetic basis.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Ekesten B, Narfstrom K. Correlation of morphologic features of the iridocorneal angle to intraocular pressure in Samoyeds. *Am J Vet Res*. 1991;52:1875-1878.

3. Ekesten B, Narfstrom K. Age-related changes in intraocular presure and iridocorneal angle in Samoyeds. *Prog Vet Comp Ophthal*. 1992;2:37-40.

4. Ekesten B. Correlation of intraocular distances to the iridocorneal angle in Samoyeds with special reference to angle-closure glaucoma. *Prog Vet Comp Ophthal*. 1993;3:67-73.

5. Ekesten B, Torrang I. Heritability of the depth of the opening of the ciliary cleft in Samoyeds. *Am J Vet Res*. 1995;56:1138-1143.

6. Ekesten B. Biological variability and measurement error variability in ocular biometry in Samoyed dogs. *Acta Vet Scand*. 1994;35:427-433.

7. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111.

8. Crispin SM, Barnett KC. Dystrophy, degeneration and infiltration of the canine cornea. *J Small Anim*

Pract. 1983;24:63-83.

9. Dice PF, 2nd. Progressive retinal atrophy in the Samoyed. *Mod Vet Pract*. 1980;61:59-60.

10. Zhang Q, Acland GM, Wu WX, et al. Different RPGR exon ORF15 mutations in Canids provide insights into photoreceptor cell degeneration. *Hum Mol Genet*. 2002;11:993-1003.

11. Meyers VN, Jezyk PF, Aguirre GD, et al. Short-limbed dwarfism and ocular defects in the Samoyed dog. *J Am Vet Med Assoc*. 1983;183:975-979.

12. Aroch I, Ofri R, Aizenberg I. Haematological, ocular and skeletal abnormalities in a Samoyed family. *J Small Anim Pract*. 1996;37:333-339.

13. Goldstein O, Guyon R, Kukekova A, et al. COL9A2 and COL9A3 mutations in canine autosomal recessive oculoskeletal dysplasia. *Mamm Genome*. 2010;21:398-408.

14. Iwabe, S., et al. (2020). "Focal/multifocal and geographic retinal dysplasia in the dog-In vivo retinal microanatomy analyses." *Vet Ophthalmol* 23(2): 292-304. PMID: 31746146

15. Bussanich M, Rootman J, Dolman C. Granulomatous panuveitis and dermal depigmentation in dogs. *J Am Anim Hosp Assoc*. 1982;18:131-138.

16. Halliwell RE. Autoimmune diseases in domestic animals. *J Am Vet Med Assoc*. 1982;181:1088-1096.

OCULAR DISORDERS REPORT
SAMOYED

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 25,252 #	%	2018-2022 5,718 #	%
GLOBE				
.110 MICROPHTHALMIA	22	0.1%	2	0.0%
10.000 GLAUCOMA	10	0.0%	1	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	7	0.0%	2	0.0%
20.160 MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	6	0.0%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	3	0.0%	1	0.0%
25.110 DISTICHIASIS	1,430	5.7%	209	3.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.0%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	16	0.1%	9	0.2%
40.910 KERATOCONJUNCTIVITIS SICCA	15	0.1%	2	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	4	0.0%	1	0.0%
CORNEA				
70.210 PANNUS	4	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	907	3.6%	212	3.7%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	17	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	10	0.0%	3	0.1%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150 IRIS COLOBOMA	1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.180 IRIS SPHINCTER DYSPLASIA	0	0.0%	1	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	499	2.0%	127	2.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	25	0.1%	13	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	39	0.2%	6	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	16	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	13	0.1%	5	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	14	0.1%	4	0.1%
93.810 UVEAL MELANOMA	1	0.0%	0	0.0%
95.120 CILIARY BODY CYST	2	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	2	0.0%	3	0.1%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	4	0.0%	0	0.0%
97.120 COLOBOMA	7	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	28	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	17	0.3%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.0%
120.960 RETINOPATHY	0	0.0%	1	0.0%
130.110 MICROPAPILLA	0	0.0%	2	0.0%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	2	0.0%
130.150 OPTIC DISC COLOBOMA	0	0.0%	2	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	100	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	834	3.3%	177	3.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	133	0.5%	97	1.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	181	0.7%	31	0.5%

OCULAR DISORDERS REPORT
SAMOYED

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 25,252 #	 %	Year Examined: 2018-2022 Total # Dogs: 5,718 #	 %
LENS Continued				
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	16	0.1%	2	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	16	0.1%	6	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	72	0.3%	13	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS	35	0.1%	11	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR	84	0.3%	51	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	99	0.4%	32	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	272	1.1%	46	0.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	30	0.1%	6	0.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	7	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	58	0.2%	5	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	41	0.2%	14	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	38	0.2%	15	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	2	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	19	0.1%	12	0.2%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	3	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	4	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	5	0.0%	3	0.1%
100.328 Y-SUTURE TIP OPACITIES	14	0.1%	12	0.2%
100.330 GENERALIZED/ COMPLETE CATARACT	66	0.3%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	2	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.0%	1	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1,279***	***5.1%***	***352***	***6.2%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	25	0.1%	8	0.1%
110.135 PHPV/ PTVL	13	0.1%	1	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	2	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	97	0.4%	5	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	514	2.0%	52	0.9%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	191	0.8%	25	0.4%
120.190 RETINAL DYSPLASIA, DETACHED	26	0.1%	6	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	56	0.2%	0	0.0%
120.400 RETINAL HEMORRHAGE	2	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	10	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	1	0.0%
120.960 RETINOPATHY	7	0.0%	3	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	19	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	14	0.1%	1	0.0%
130.150 OPTIC DISC COLOBOMA	73	0.3%	2	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	176	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	450	1.8%	2	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	306	1.2%	193	3.4%
NORMAL				
.000 NORMAL GLOBE	20,671	81.9%	4,614	80.7%

SCHAPENDOES

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Retinal atrophy				
	- (*CCDC66)*	Autosomal recessive	2, 3	NO	Mutation in the *CCDC66* gene

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Retinal atrophy - *CCDC66*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

In the Schapendoes the age of onset is between 2-5 years of age. The causal mutation is a single base pair insertion in exon 6 of the gene coiled-coil domain containing 66 (*CCDC66)* that leads to a stop codon. The mutation is inherited as an autosomal recessive trait. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Dekomien G, Vollrath C, Petrasch-Parwez E, et al. Progressive retinal atrophy in Schapendoes dogs: mutation of the newly identified CCDC66 gene. *Neurogenetics.* 2010 May;11:163-174.

3. Lippmann T, Jonkisz A, Dobosz T, et al. Haplotype-defined linkage region for gPRA in Schapendoes dogs. *Mol Vis*. 2007;13:174-180.

OCULAR DISORDERS REPORT
SCHAPENDOES

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 97 #	 %	2018-2022 #	 %
EYELIDS				
25.110 DISTICHIASIS	2	2.1%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	0	0.0%	1	2.1%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	1.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	1.0%	1	2.1%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	4.1%	7	14.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	4	4.1%	5	10.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	1.0%	1	2.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	0	0.0%	1	2.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	2	4.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	3	6.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	2	2.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	2	2.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	0	0.0%	1	2.1%
100.328 Y-SUTURE TIP OPACITIES	2	2.1%	1	2.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***9***	***9.3%***	***13***	***27.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	2.1%	1	2.1%
110.320 VITREOUS DEGENERATION SYNERESIS	1	1.0%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	4.2%
RETINA				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	1.0%	0	0.0%
OTHER				
900.100 OTHER, NOT INHERITED	6	6.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	3	6.3%
NORMAL				
.000 NORMAL GLOBE	78	80.4%	32	66.7%

SCHIPPERKE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
SCHIPPERKE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,552		325	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.1%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	0	0.0%	1	0.3%
25.110	DISTICHIASIS	48	3.1%	8	2.5%
CORNEA					
70.210	PANNUS	1	0.1%	0	0.0%
70.220	PIGMENTARY KERATITIS	0	0.0%	1	0.3%
70.700	CORNEAL DYSTROPHY	3	0.2%	1	0.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	140	9.0%	20	6.2%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	6	0.4%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	10	0.6%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	7	0.5%	3	0.9%
LENS					
100.200	CATARACT, UNSPECIFIED	4	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	70	4.5%	11	3.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	20	1.3%	5	1.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.1%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.4%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.2%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	12	0.8%	2	0.6%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.1%	2	0.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	24	1.5%	4	1.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	11	0.7%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	9	0.6%	2	0.6%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	7	0.5%	2	0.6%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.1%	1	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	1	0.3%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	2	0.1%	2	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	8	0.5%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***115***	***7.4%***	***19***	***5.8%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	0	0.0%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	20	1.3%	4	1.2%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	10	0.6%	1	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	4	0.3%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	17	1.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.3%
120.960	RETINOPATHY	2	0.1%	0	0.0%
FUNDUS					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.3%

OCULAR DISORDERS REPORT
SCHIPPERKE

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 1,552 #	 %	Year Examined: 2018-2022 Total # Dogs: 325 #	 %
OTHER					
900.000	OTHER, UNSPECIFIED	16	1.0%	0	0.0%
900.100	OTHER, NOT INHERITED	51	3.3%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	27	1.7%	12	3.7%
NORMAL					
.000	NORMAL GLOBE	1,231	79.3%	266	81.8%

SCOTTISH DEERHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SCOTTISH DEERHOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
SCOTTISH DEERHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 22 #	%	2018-2022 9 #	%
GLOBE				
.110 MICROPHTHALMIA	0	0.0%	1	11.1%
EYELIDS				
25.110 DISTICHIASIS	5	22.7%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3	13.6%	3	33.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	0	0.0%	2	22.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	0	0.0%	1	11.1%
LENS				
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	11.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	4.5%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***4.5%***	***1***	***11.1%***
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	4.5%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	17	77.3%	5	55.6%

SCOTTISH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to lens	Not defined	1	NO	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
	- endothelial opacity/no strands	Not defined	1	NO	
B.	Cataract	Not defined	1	NO	
C.	Ligneous conjunctivitis	Not defined	2,3	NO	mutation in *PLG* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Ligneous conjunctivitis

A rare type of conjunctivitis characterized by the formation of thick membranes covering conjunctiva of the nictitans and eyelids of affected dogs. This condition has been diagnosed in four unrelated Doberman Pinschers, three of which had life-threatening systemic disease. In Scottish Terriers, it is associated with a single nucleotide polymorphism in the plasminogen (PLG) gene.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Mason SL, McElroy P, Nuttall T. Ligneous membranitis in Scottish Terriers. Vet Rec. 2012; 171: 160.

3. Ainsworth S, Carter SS, Fisher C, Dawson J, Makrides L, Nuttall T, Mason SL. Ligneous membranitis in Scottish Terriers is associated with a single nucleotide polymorphism in the plasminogen (PLG) gene. Anim Genet. 2015 46(6):707-710.

OCULAR DISORDERS REPORT
SCOTTISH TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 866 #	 %	2018-2022 180 #	 %
EYELIDS				
25.110 DISTICHIASIS	3	0.3%	1	0.6%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.1%	0	0.0%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	2	0.2%	0	0.0%
CORNEA				
70.210 PANNUS	1	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS	2	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY	6	0.7%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	2	0.2%	0	0.0%
UVEA				
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	3	0.3%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	252	29.1%	58	32.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	43	5.0%	5	2.8%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	10	1.2%	2	1.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	3	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	94	10.9%	70	38.9%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	8	0.9%	3	1.7%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	81	9.4%	5	2.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	8	0.9%	2	1.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.5%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	5	0.6%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	5	0.6%	2	1.1%
100.307 PUNCTATE CATARACT, CAPSULAR	3	0.3%	3	1.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	6	0.7%	2	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	6	0.7%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	3	0.3%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	9	1.0%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.2%	4	2.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.6%
100.328 Y-SUTURE TIP OPACITIES	2	0.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	5	0.6%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***66***	***7.6%***	***14***	***7.8%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	1	0.6%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	4	0.5%	1	0.6%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	1.1%
130.110 MICROPAPILLA	0	0.0%	1	0.6%

OCULAR DISORDERS REPORT
SCOTTISH TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 866 #	 %	2018-2022 180 #	 %
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	5	0.6%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	8	0.9%	0	0.0%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	2	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	13	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED	60	6.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	22	2.5%	10	5.6%
NORMAL				
.000 NORMAL GLOBE	446	51.5%	68	37.8%

SEALYHAM TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Lens luxation	Autosomal recessive	1-5	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Formston C. Observations on subluxation and luxation of the crystalline lens in the dog. *J Comp Pathol*. 1945;55:168-186.

3. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract*. 1963;4:447-456.

4. Curtis R, Barnett KC. Primary lens luxation in the dog. *J Small Anim Pract*. 1980;21:657-668.

5. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384.

OCULAR DISORDERS REPORT
SEALYHAM TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 500 #	%	2018-2022 47 #	%
EYELIDS				
25.110 DISTICHIASIS	28	5.6%	1	2.1%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.2%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	35	7.0%	4	8.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.4%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	0.6%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.2%	0	0.0%
FUNDUS				
97.120 COLOBOMA	1	0.2%	0	0.0%
130.110 MICROPAPILLA	0	0.0%	1	2.1%
LENS				
100.200 CATARACT, UNSPECIFIED	2	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	20	4.0%	1	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	4	0.8%	1	2.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.6%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	5	1.0%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.6%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	8	1.6%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	2	0.4%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.4%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	7	1.4%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	5	1.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***41***	***8.2%***	***1***	***2.1%***
VITREOUS				
110.135 PHPV/ PTVL	2	0.4%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	5	1.0%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	9	1.8%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	1	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	11	2.2%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.2%	0	0.0%
120.960 RETINOPATHY	0	0.0%	1	2.1%
OPTIC NERVE				
130.110 MICROPAPILLA	0	0.0%	1	2.1%
130.120 OPTIC NERVE HYPOPLASIA	1	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	4	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED	10	2.0%	1	2.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	0.4%	2	4.3%

OCULAR DISORDERS REPORT
SEALYHAM TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 500 #	%	2018-2022 47 #	%
NORMAL				
.000 NORMAL GLOBE	416	83.2%	35	74.5%

SEPPALA SIBERIAN SLED DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SEPPALA SIBERIAN SLED DOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
SEPPALA SIBERIAN SLED DOG

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	1		8	
Diagnostic Name	**#**	**%**	**#**	**%**
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	0	0.0%	1	12.5%
NORMAL				
.000 NORMAL GLOBE	1	100.0%	7	87.5%

SERBIAN HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- (*prcd*)	Autosomal recessive	1, 2	NO	Mutation in the *prcd* gene

Description and Comments

A. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Serbian Hound is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Serbian Hound. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
SERBIAN HOUND

There are no statistics available for this breed

SHETLAND SHEEPDOG
(Sheltie)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial / stromal	Not defined	1, 2	Breeder option	
C.	Sheltie corneal dystrophy	Not defined	3	NO	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	NO	1	
	-*CNGA1*	Autosomal recessive	4	NO	Mutation in the *CNGA1 gene*
	- *BBS2*	Autosomal recessive	10	NO	Mutation in the *BBS2* gene
	- Slowly progressive retinopathy	Not defined	5	NO	
G.	Choroidal hypoplasia (Collie eye anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/coloboma	Autosomal recessive	6-9	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

Distichiasis in the Shetland Sheepdog usually involves stiff lashes which require permanent epilation.

B. Corneal dystrophy, epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Sheltie corneal dystrophy

The corneal changes in the Shetland Sheepdog are characterized grossly by multifocal, central, subepithelial and superficial stromal, grey-white, circular or irregular rings. Some affected animals develop corneal erosions. The preocular tear film in the majority of dogs is unstable and requires symptomatic therapy to keep the patients comfortable. Further studies are necessary to define this disorder.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms are seen in the Shetland sheepdog and pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

- CNGA1

One form of PRA in the Shetland Sheepdog is caused by a 4bp exonic deletion in *CNGA1.* However multiple forms of PRA exist in the breed and slowly progressive retinopathy is also not genetically linked to this mutation. A DNA test is available; however it will only detect this mutation.

- BBS2

A novel form of PRA has been linked to a missense variant (single nucleotide variant in exon 11) in the Bardet-Biedl Syndrome 2 gene (BBS2). This disease is syndromic with facial abnormalities.

- Slowly progressive retinopathy

A retinal disease that is poorly defined. May be a variant of PRA.

G. Choroidal hypoplasia (Collie eye anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie eye anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Crispin SM, Barnett KC. Dystrophy, degeneration and infiltration of the canine cornea. *J Small Anim Pract*. 1983;24:63-83.

3. Cooley PL, Dice PF 2nd. Corneal dystrophy in the dog and cat. Vet Clin North Am Small Anim Pract. 1990 May;20(3):681-92. doi: 10.1016/s0195-5616(90)50057-1. PMID: 2194353.

4 Wiik AC, Ropstad EO, Ekesten B, et al. Progressive retinal atrophy in Shetland Sheepdog is associated with a mutation in the CNGA1 gene. *Anim Genet*. 2015;46:515-521.

5. Karlstam L, Hertil E, Zeiss C, et al. A slowly progressive retinopathy in the Shetland Sheepdog. *Vet Ophthalmol*. 2011;14:227-238.

6. Barnett KC, Stades FC. Collie eye anomaly in the Shetland Sheepdog in the Netherlands. *J Small Anim Pract*. 1979;20:321-329.

7. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Gen Res*. 2007;17:1562-1571.

8. Fredholm M, Larsen RC, Jönsson M, Söderlund MA, Hardon T, Proschowsky HF. Discrepancy in compliance between the clinical and genetic diagnosis of choroidal hypoplasia in Danish Rough Collies and Shetland Sheepdogs. Anim Genet. 2016 Apr; 47(2): 250-2.

9. Marelli SP, Rizzi R, Paganelli A, Bagardi M, Minozzi G, Braambillaa PG, Polli M. Genotypic and allelic frequency of a mutation in the *NHEJ1* gene associated with collie eye anomaly in dogs in Italy. Vet Rec Open. 2022 29;9(1); e26. doi: 10.1002/vro2.26. ***reference from non-US population (Italy))***

10. Hitti-Malin RJ, Burmeister LM, Lingaas F, Kaukonen M, Pettinen I, Lohi H, Sargan D, Mellaersh CS. A missense variant in the Bardet-Biedl Syndrome 2 gene (*BBS2*) leads to aa novel syndromic retinal degeneration in the Shetland Sheepdog

OCULAR DISORDERS REPORT
SHETLAND SHEEPDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 40,704 #	%	2018-2022 4,878 #	%
GLOBE				
.110 MICROPHTHALMIA	68	0.2%	11	0.2%
10.000 GLAUCOMA	2	0.0%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	9	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	8	0.0%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	10	0.0%	0	0.0%
25.110 DISTICHIASIS	2,602	6.4%	237	4.9%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.0%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	6	0.0%	1	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	7	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	7	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	4	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	9	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS	5	0.0%	2	0.0%
70.700 CORNEAL DYSTROPHY	1,114	2.7%	102	2.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	35	0.1%	2	0.0%
70.750 SHELTIE CORNEAL DYSTROPHY	0	0.0%	1	0.0%
UVEA				
90.250 PIGMENTARY UVEITIS	1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA	6	0.0%	2	0.0%
93.120 IRIS CYST	20	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	5	0.0%	0	0.0%
93.150 IRIS COLOBOMA	27	0.1%	1	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	4	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1,746	4.3%	218	4.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	124	0.3%	6	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	202	0.5%	10	0.2%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	29	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	17	0.0%	7	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	22	0.1%	10	0.2%
93.810 UVEAL MELANOMA	1	0.0%	0	0.0%
95.120 CILIARY BODY CYST	4	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	7	0.0%	5	0.1%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	135	0.3%	34	0.7%
97.120 COLOBOMA	82	0.2%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	4	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
120.960 RETINOPATHY	0	0.0%	1	0.0%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.0%
130.150 OPTIC DISC COLOBOMA	0	0.0%	16	0.3%
LENS				
100.200 CATARACT, UNSPECIFIED	73	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	645	1.6%	107	2.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	102	0.3%	36	0.7%

OCULAR DISORDERS REPORT
SHETLAND SHEEPDOG

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 40,704 #	 %	2018-2022 4,878 #	 %
LENS Continued				
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	78	0.2%	14	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	34	0.1%	6	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	14	0.0%	1	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	16	0.0%	4	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS	63	0.2%	24	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR	46	0.1%	24	0.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	154	0.4%	27	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	103	0.3%	20	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	59	0.1%	8	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	6	0.0%	1	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	13	0.0%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	38	0.1%	6	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	39	0.1%	10	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	4	0.0%	5	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	6	0.0%	3	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	3	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	2	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	4	0.0%	2	0.0%
100.328 Y-SUTURE TIP OPACITIES	7	0.0%	5	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT	47	0.1%	2	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	7	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***904***	***2.2%***	***198***	***4.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	97	0.2%	2	0.0%
110.135 PHPV/ PTVL	20	0.0%	3	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.0%	1	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	144	0.4%	16	0.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	94	0.2%	10	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	17	0.0%	5	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	5	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	218	0.5%	5	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	18	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	22	0.1%	2	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	18	0.0%	2	0.0%
130.120 OPTIC NERVE HYPOPLASIA	25	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	193	0.5%	9	0.2%
OTHER				
900.000 OTHER, UNSPECIFIED	243	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED	575	1.4%	5	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	350	0.9%	180	3.7%
NORMAL				
.000 NORMAL GLOBE	34,315	84.3%	3,940	80.8%

SHIBA INU

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1-3	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Y-suture tip opacity	Not defined	1	Breeder option

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

A recent study found that a *SRBD1* polymorphism in exon 4 plays an important role in the development of glaucoma in the Shiba Inu. A genetic test is not yet available.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

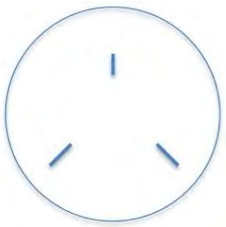
D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect

both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

References

1. ACVO Genetics Committee and Data from OFA All-Breeds Report.

2. Kanemaki N, Tchedre KT, Imayasu M, et al. Dogs and humans share a common susceptibility gene SRBD1 for glaucoma risk. *PloS one*. 2013;8:e74372.

3. Kato K, Sasaki N, Matsunaga S, et al. Possible association of glaucoma with pectinate ligament dysplasia and narrowing of the iridocorneal angle in Shiba Inu dogs in Japan. *Vet Ophthalmol*. 2006;9:71-75.

OCULAR DISORDERS REPORT
SHIBA INU

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4,847 #	%	2018-2022 1,179 #	%
GLOBE				
10.000 GLAUCOMA	2	0.0%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	4	0.1%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	6	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	12	0.2%	0	0.0%
25.110 DISTICHIASIS	115	2.4%	24	2.0%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	2	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	4	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS	10	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY	35	0.7%	1	0.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	10	0.2%	1	0.1%
UVEA				
93.120 IRIS CYST	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	198	4.1%	47	4.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	15	0.3%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	2	0.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	37	0.8%	41	3.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	3	0.1%	0	0.0%
95.120 CILIARY BODY CYST	1	0.0%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	10	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	212	4.4%	61	5.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	14	0.3%	6	0.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	20	0.4%	9	0.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.1%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.1%	1	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	64	1.3%	48	4.1%
100.306 PUNCTATE CATARACT, NUCLEUS	2	0.0%	1	0.1%
100.307 PUNCTATE CATARACT, CAPSULAR	10	0.2%	5	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	36	0.7%	9	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	25	0.5%	4	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	13	0.3%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	4	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	17	0.4%	9	0.8%
100.316 INCIPIENT CATARACT, NUCLEUS	5	0.1%	2	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	6	0.1%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	1	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	32	0.7%	69	5.9%
100.330 GENERALIZED/ COMPLETE CATARACT	19	0.4%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***253***	***5.2%***	***100***	***8.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	21	0.4%	8	0.7%
110.135 PHPV/ PTVL	4	0.1%	0	0.0%

OCULAR DISORDERS REPORT
SHIBA INU

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 4,847 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,179 #	 %
VITREOUS Continued				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	29	0.6%	1	0.1%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	4	0.3%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	9	0.2%	2	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.0%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	29	0.6%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	2	0.0%	0	0.0%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	7	0.1%	1	0.1%
OTHER				
900.000 OTHER, UNSPECIFIED	31	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED	96	2.0%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	52	1.1%	43	3.6%
NORMAL				
.000 NORMAL GLOBE	4,064	83.8%	902	76.5%

SHIH TZU

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Keratoconjunctivitis sicca	Not defined	1, 2	NO	
B.	Glaucoma	Not defined	3	NO	
C.	Entropion	Not defined	1	Breeder option	
D.	Distichiasis	Not defined	1	Breeder option	
E.	Ectopic cilia	Not defined	1	Breeder option	
F.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
G.	Pigmentary keratitis	Not defined	1	Breeder option	
H.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
I.	Cataract	Not defined	1	NO	
J.	Y-tip suture opacities	Not defined	1	Breeder option	
K.	Vitreous degeneration				
	- anterior chamber	Not defined	1, 4, 5	Breeder option	
	- syneresis	Not defined	1	Breeder option	
L.	Retinal detachment	Not defined	4, 6	NO	
M.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- *JPH2*	Autosomal recessive	8	NO**	Mutation in *JPH2* gene
N.	Optic nerve hypoplasia	Not defined	7	NO	

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
O.	Retinal degeneration	Not defined	6	NO	

Description and Comments

A. Keratoconjunctivitis sicca (KCS)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

B. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

A recent study found that a *SRBD1* polymorphism in intron 1 plays an important role in the development of glaucoma in the Shih Tzu. A genetic test is not yet available.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

D. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

E. Ectopic cilia

Hair emerging through the eyelid conjunctiva. Ectopic cilia occur more frequently in younger dogs and cause discomfort and corneal disease.

F. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

G. Exposure keratitis

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower

eyelid medial entropion, lagophthalmos and macropalpebral fissure.

H. Persistent pupillary membranes (PPMs)

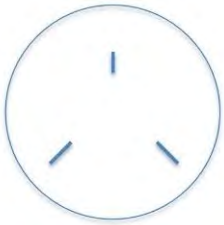
Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

I. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

J. Y-tip suture opacities

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

K. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment. Forms may include presentataion into the anterior chamber, or simply contined within the posterior segment (syneresis).

L. Retinal detachment

A separation of the sensory retina from the underlying tissue. It results in blindness when complete.

M. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- JPH2

A homozygous nonsense mutation has been identified in the JPH2 gene of Shih Tzu dogs with PRA (from Thailand). *JPH2 has been previously found to be expressed in several excitable cells/tissues, including retinal photoreceptors, making it a candidate gene for PRA in Shih Tzus. The data in this paper were derived from a small population of dogs.*

N. Optic nerve hypoplasia

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

O. Retinal degeneration

A unilateral or bilateral retinal disease which can be progressive. When bilateral, the ophthalmoscopic lesions are sometimes asymmetrical, particularly in the early stages of the disease. Fundus examination shows initially single or multiple focal retinal lesions that appear active (local infiltrative inflammation or granulation) or inactive. The lesions can progress resulting in widespread retinal atrophy. The end-stage ophthalmoscopic lesions vary and may appear indistinguishable from PRA, or may be more characteristic of an inflammatory retinopathy. The asymmetry of the fundus abnormalities and the presence of inflammatory lesions in the retina and choroid help to differentiate this disorder from PRA. The mode of inheritance of this disease is not known; however, studies of different families suggest that it is possibly inherited. An intriguing aspect of the disease has been the preponderance of affected males compared to females. This has been confirmed in a recent unpublished survey.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Sanchez RF, Innocent G, Mould J, et al. Canine keratoconjunctivitis sicca: disease trends in a review of 229 cases. *J Small Anim Pract*. 2007;48:211-217.

3. Kanemaki N, Tchedre KT, Imayasu M, et al. Dogs and humans share a common susceptibility gene SRBD1 for glaucoma risk. *PloS one*. 2013;8:e74372.

4. Hendrix DV, Nasisse MP, Cowen P, et al. Clinical signs, concurrent diseases and risk factors associated with retinal detachment in dogs. *Prog Vet Comp Ophthal*. 1993;3:87-91.

5. Krishnan, H., et al. (2020). "Vitreous degeneration and associated ocular abnormalities in the dog." *Vet Ophthalmol* 23(2): 219-224. PMID: 31464365

6. Itoh Y, Maehara S, Yamasaki A, et al. Investigation of fellow eye of unilateral retinal detachment in Shih-Tzu. *Vet Ophthalmol*. 2010;13:289-293.

7. da Silva EG, Dubielzig R, Zarfoss MK, et al. Distinctive histopathologic features of canine optic

nerve hypoplasia and aplasia: a retrospective review of 13 cases. *Vet Ophthalmol*. 2008;11:23-29.

8. Urkasemsin G, Pongpanich M, Sariyaa L, Kongchaaroen A, Buddhirongawatr R, Rungarunlert S, Ferreira JN, Chetuengchai W, Phokaew C, Srichomthong C, Shotelersuk V. Whole genome sequencing identifies a homozygous nonsense mutation in the JPH2 gene in Shih Tzu dogs with progressive retinal atrophy. *Anim Genet*. 2021 52;(5):714-719. PMID: 34231238 **reference derived from non-USA dog population**

OCULAR DISORDERS REPORT
SHIH TZU

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2,893		966	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	6	0.2%	1	0.1%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	2	0.2%
EYELIDS					
20.140	ECTOPIC CILIA	41	1.4%	5	0.5%
20.160	MACROPALPEBRAL FISSURE	57	2.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	197	6.8%	110	11.4%
22.000	ECTROPION, UNSPECIFIED	4	0.1%	0	0.0%
25.110	DISTICHIASIS	512	17.7%	125	12.9%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	6	0.2%	1	0.1%
40.910	KERATOCONJUNCTIVITIS SICCA	26	0.9%	3	0.3%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	25	0.9%	0	0.0%
70.220	PIGMENTARY KERATITIS	175	6.0%	61	6.3%
70.700	CORNEAL DYSTROPHY	34	1.2%	3	0.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	4	0.1%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	0	0.0%	1	0.1%
93.120	IRIS CYST	5	0.2%	0	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150	IRIS COLOBOMA	5	0.2%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	47	1.6%	13	1.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	5	0.2%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.2%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.1%	1	0.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	0	0.0%	1	0.1%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
97.120	COLOBOMA	2	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
LENS					
100.200	CATARACT, UNSPECIFIED	16	0.6%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	70	2.4%	10	1.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	20	0.7%	4	0.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	9	0.3%	3	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	5	0.2%	2	0.2%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	5	0.2%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	21	0.7%	4	0.4%
100.306	PUNCTATE CATARACT, NUCLEUS	3	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	6	0.2%	2	0.2%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	23	0.8%	6	0.6%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	21	0.7%	2	0.2%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	15	0.5%	4	0.4%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	8	0.3%	1	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	8	0.3%	1	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.1%	2	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.1%	2	0.2%

OCULAR DISORDERS REPORT
SHIH TZU

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,893 #	 %	Year Examined: 2018-2022 Total # Dogs: 966 #	 %
LENS Continued				
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	1	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	2	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES	2	0.1%	14	1.4%
100.330 GENERALIZED/ COMPLETE CATARACT	25	0.9%	1	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***193***	***6.7%***	***39***	***4.0%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	18	0.6%	3	0.3%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	36	1.2%	10	1.0%
110.320 VITREOUS DEGENERATION SYNERESIS	145	5.0%	30	3.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	12	0.4%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	4	0.1%	1	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	41	1.4%	1	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	9	0.3%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.1%	0	0.0%
120.960 RETINOPATHY	4	0.1%	0	0.0%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	11	0.4%	0	0.0%
130.150 OPTIC DISC COLOBOMA	4	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	43	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED	99	3.4%	3	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	122	4.2%	97	10.0%
NORMAL				
.000 NORMAL GLOBE	1,716	59.3%	598	61.9%

SHIKOKU

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
SHIKOKU

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 34 #	 %	Year Examined: 2018-2022 Total # Dogs: 39 #	 %
EYELIDS					
25.110	DISTICHIASIS	0	0.0%	1	2.6%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	18	52.9%	12	30.8%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	8.8%	2	5.1%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	11.8%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	3	8.8%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	2	5.9%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***5***	***14.7%***	***0***	***0.0%***
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	2.9%	5	12.8%
NORMAL					
.000	NORMAL GLOBE	9	26.5%	22	56.4%

SHILOH SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option

Description and Comments

A. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
SHILOH SHEPHERD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 286 #	 %	Year Examined: 2018-2022 Total # Dogs: 74 #	 %
EYELIDS				
25.110 DISTICHIASIS	2	0.7%	1	1.4%
NICTITANS				
50.210 PLASMOMA/ ATYPICAL PANNUS	1	0.3%	1	1.4%
CORNEA				
70.210 PANNUS	3	1.0%	0	0.0%
70.700 CORNEAL DYSTROPHY	33	11.5%	9	12.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.3%	0	0.0%
UVEA				
93.120 IRIS CYST	2	0.7%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3	1.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	1.4%
95.120 CILIARY BODY CYST	0	0.0%	1	1.4%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	12	4.2%	1	1.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.3%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.3%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.7%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.3%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.3%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	1.4%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.3%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***8***	***2.8%***	***1***	***1.4%***
FUNDUS				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	1.4%
RETINA				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.7%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	0.3%	0	0.0%
900.100 OTHER, NOT INHERITED	4	1.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	0.7%	2	2.7%
NORMAL				
.000 NORMAL GLOBE	242	84.6%	60	81.1%

SHORTY BULL

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SHORTY BULL breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
SHORTY BULL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2 #	 %	2018-2022 1 #	 %
LENS				
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	100.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***0***	***0.0%***	***1***	***100.0%***
NORMAL				
.000 NORMAL GLOBE	2	100.0%	0	0.0%

SIBERIAN HUSKY

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	1-4	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Presumed autosomal recessive	1, 5-8	NO	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1, 4	NO	
F.	Retinal atrophy				
	- (*RPGR*)	X-linked	1, 9, 10	NO	Mutation in the *RPGR* gene
G.	Cone degeneration - (achromatopsia)	Autosomal recessive	11, 12	NO	Mutation in the *CNGB3* gene
H.	Uveodermatologic syndrome	Not defined	1, 13-15	NO	

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

In the Siberian Husky, the opacities are bilaterally symmetrical, round to oval and ring shaped. They occur early in life (0.5-2 years) and may progress to cause significant vision loss. When seen, it may be beneficial to feed a low fat diet and recheck the eyes the following year to see if the opacities resolve, ruling out inherited corneal dystrophy.

D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Siberian Husky, cataracts begin in the axial posterior cortex at approximately one year of age. Progression is variable and vision impairment may occur. In cases with rapid progression, secondary lens-induced uveitis and glaucoma may be associated with partial cataract resorption.

F. Retinal atrophy – (*RPGR*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In the Siberian Husky, one form of PRA, known as XLPRA1, is due to a mutation in the *RPGR* gene and is inherited as a recessive, sex-linked trait. A DNA test is available.

G. Cone degeneration - hemeralopia/achromatopsia

Autosomal recessively inherited early degeneration of the cone photoreceptors. Afflicted puppies develop day-blindness, colorblindness, and photophobia between 8 and 12 weeks of age. Afflicted dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A missense mutation in the same gene (*CNGB3*) that has been identified in CD-affected Alaskan Malamute-derived dogs has been detected in German Shorthaired Pointers affected with a clinically identical allelic disorder. A DNA test is available.

H. Uveodermatologic syndrome

Uveodermatologic syndrome in the Siberian Husky bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. Adhesions between the iris and lens (posterior synechia) and the peripheral iris and cornea (peripheral anterior synechia) develop rapidly. Other complications include cataract development, retinal degeneration, retinal separation or detachment, optic disc atrophy and secondary glaucoma. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. The genetics of this condition are unclear, but some genetic predisposition is indicated by the higher prevalence of this disorder in Siberian Huskies compared with other dog breeds. Affected dogs are generally young, ranging in age between 1-1/2 to 4 years.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds-Report.

2. Slater MR, Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc*. 1986;188:1028-1030.

3. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111.

4. Stanley RG, Blogg JR. Eye diseases in Siberian Husky dogs. *Aust Vet J*. 1991;68:161-162.

5. Cooley PL, Dice PF, 2nd. Corneal dystrophy in the dog and cat. *Vet Clin North Am Small Anim Pract*. 1990;20:681-692.

6. MacMillan AD, Waring GO, 3rd, Spangler WL, et al. Crystalline corneal opacities in the Siberian Husky. *J Am Vet Med Assoc*. 1979;175:829-832.

7. Waring GO, Elkins MB, Spangler W. Oval lipid corneal opacities in beagles and crystalline lipid corneal opacities in Siberian Huskies. *Metab Pediatr Ophthalmol*. 1979;3:203-213.

8. Waring GO, 3rd. Inheritance of crystalline corneal dystrophy in Siberian Huskies. *J Am Anim Hosp Assoc*. 1986;22:655.

9. Acland GM, Blanton SH, Hershfield B, et al. XLPRA: a canine retinal degeneration inherited as an X-linked trait. *Am J Med Genet*. 1994;52:27-33.

10. Zhang Q, Acland GM, Wu WX, et al. Different RPGR exon ORF15 mutations in Canids provide insights into photoreceptor cell degeneration. *Hum Mol Genet*. 2002;11:993-1003.

11. Sidjanin DJ, Lowe JK, McElwee JL, et al. Canine CNGB3 mutations establish cone degeneration as orthologous to the human achromatopsia locus ACHM3. *Human Molecular Genetics*. 2002;11:1823-1833

12. Yeh CY, Goldstein O, Kukekova AV, Holley D, Knollinger AM, Huson HJ, Pearce-Kelling SE, Acland GM, Komáromy AM. Genomic deletion of CNGB3 is identical by descent in multiple canine breeds and causes achromatopsia. BMC Genet. 2013 Apr 20;14:27. doi: 10.1186/1471-2156-14-27. PMID: 23601474

13. Halliwell RE. Autoimmune diseases in domestic animals. *J Am Vet Med Assoc*. 1982;181:1088-1096.

14. Bussanich M, Rootman J, Dolman C. Granulomatous panuveitis and dermal depigmentation in dogs. *J Am Anim Hosp Assoc*. 1982;18:131-138.

15. Kern TJ, Walton DK, Riis RC, et al. Uveitis associated with poliosis and vitiligo in six dogs. *J Am Vet Med Assoc*. 1985;187:408-414.

OCULAR DISORDERS REPORT
SIBERIAN HUSKY

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 40,366 #	 %	2018-2022 5,943 #	 %
GLOBE				
.110 MICROPHTHALMIA	7	0.0%	0	0.0%
10.000 GLAUCOMA	12	0.0%	4	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.0%
EYELIDS				
20.110 EYELID DERMOID	4	0.0%	0	0.0%
20.140 ECTOPIC CILIA	3	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	20	0.0%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	4	0.0%	0	0.0%
25.110 DISTICHIASIS	422	1.0%	48	0.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.0%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.0%	2	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	3	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	2	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	2	0.0%	0	0.0%
CORNEA				
70.210 PANNUS	22	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS	3	0.0%	1	0.0%
70.700 CORNEAL DYSTROPHY	1,041	2.6%	107	1.8%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	37	0.1%	2	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	3	0.0%	2	0.0%
93.120 IRIS CYST	20	0.0%	2	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150 IRIS COLOBOMA	8	0.0%	1	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	959	2.4%	184	3.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	28	0.1%	3	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	55	0.1%	4	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	6	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	21	0.1%	10	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	17	0.0%	3	0.1%
93.810 UVEAL MELANOMA	1	0.0%	1	0.0%
95.120 CILIARY BODY CYST	1	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	3	0.0%	1	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	52	0.1%	13	0.2%
97.120 COLOBOMA	16	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	4	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	4	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	2	0.0%
120.960 RETINOPATHY	0	0.0%	4	0.1%
130.110 MICROPAPILLA	0	0.0%	1	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	576	1.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	746	1.8%	142	2.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	114	0.3%	51	0.9%

OCULAR DISORDERS REPORT
SIBERIAN HUSKY

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 40,366 #	 %	2018-2022 5,943 #	 %
LENS Continued				
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	219	0.5%	23	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	43	0.1%	7	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	14	0.0%	3	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	112	0.3%	16	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS	49	0.1%	38	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR	78	0.2%	38	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	151	0.4%	33	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1,341	3.3%	124	2.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	74	0.2%	18	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	18	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	262	0.6%	6	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	101	0.3%	13	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	103	0.3%	32	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	11	0.0%	9	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	96	0.2%	87	1.5%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	6	0.0%	10	0.2%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	2	0.0%	2	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	7	0.0%	7	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	19	0.0%	23	0.4%
100.327 INCOMPLETE CATARACT, CAPSULAR	8	0.0%	6	0.1%
100.328 Y-SUTURE TIP OPACITIES	9	0.0%	21	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT	473	1.2%	8	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT	2	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	14	0.0%	1	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***3,879***	***9.6%***	***554***	***9.3%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	52	0.1%	17	0.3%
110.135 PHPV/ PTVL	7	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	39	0.1%	3	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	93	0.2%	9	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	55	0.1%	6	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	14	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	168	0.4%	4	0.1%
120.400 RETINAL HEMORRHAGE	7	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	27	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	3	0.1%
120.960 RETINOPATHY	28	0.1%	20	0.3%
120.970 CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	3	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	7	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	3	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	354	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	760	1.9%	1	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	642	1.6%	295	5.0%
NORMAL				
.000 NORMAL GLOBE	34,019	84.3%	4,811	81.0%

SILKEN WINDHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Vitreous degeneration				
	-syneresis	Not defined	1	Breeder option	
C.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Autosomal recessive	1, 2	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Vitreous degeneration -syneresis

A liquefaction of the vitreous gel which may predispose to retinal detachment.

C. Choroidal hypoplasia (Collie Eye Anomaly)
- Staphyloma/coloboma
- Retinal detachment
- Retinal hemorrhage
- Optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Gen Res*. 2007;17:1562-1571.

OCULAR DISORDERS REPORT
SILKEN WINDHOUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 435 #	 %	2018-2022 548 #	 %
GLOBE				
.110 MICROPHTHALMIA	0	0.0%	2	0.4%
EYELIDS				
25.110 DISTICHIASIS	4	0.9%	4	0.7%
CORNEA				
70.700 CORNEAL DYSTROPHY	0	0.0%	1	0.2%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	0.2%	5	0.9%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	1	0.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	0.2%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.2%	1	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.4%
120.960 RETINOPATHY	0	0.0%	1	0.2%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	19	4.4%	20	3.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.2%	5	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.5%	1	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.2%	2	0.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.7%	3	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.2%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	6	1.4%	6	1.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	2	0.5%	6	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.2%	1	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	3	0.7%	2	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.2%	3	0.5%
100.327 INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES	4	0.9%	7	1.3%
100.330 GENERALIZED/ COMPLETE CATARACT	0	0.0%	1	0.2%
100.340 RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.2%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***21***	***4.8%***	***34***	***6.2%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	1	0.2%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.9%	3	0.5%
110.320 VITREOUS DEGENERATION SYNERESIS	5	1.1%	6	1.1%
RETINA				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	3	0.7%	1	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.2%	0	0.0%
120.960 RETINOPATHY	3	0.7%	2	0.4%
OTHER				
900.000 OTHER, UNSPECIFIED	2	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED	0	0.0%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	12	2.8%	25	4.6%
NORMAL				
.000 NORMAL GLOBE	395	90.8%	470	85.8%

SILKY TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
E.	Retinal atrophy (*prcd)*	Autosomal recessive	2	NO	Mutation in the *prcd* gene

Description and Comments

A. Entropion

A conformational defect resulting in an "in rolling" of one or more of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally in the neonatal period. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also

known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Silky Terrier is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

OCULAR DISORDERS REPORT
SILKY TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 788 #	%	2018-2022 214 #	%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	1	0.1%	8	3.7%
25.110 DISTICHIASIS	3	0.4%	0	0.0%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.9%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	0	0.0%	1	0.5%
70.700 CORNEAL DYSTROPHY	8	1.0%	0	0.0%
UVEA				
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	55	7.0%	11	5.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.4%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	0	0.0%	1	0.5%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	1	0.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.3%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	2	0.3%	1	0.5%
LENS				
100.200 CATARACT, UNSPECIFIED	4	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	41	5.2%	12	5.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	12	1.5%	4	1.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	4	0.5%	4	1.9%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	10	1.3%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	1	0.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.3%	5	2.3%
100.306 PUNCTATE CATARACT, NUCLEUS	3	0.4%	3	1.4%
100.307 PUNCTATE CATARACT, CAPSULAR	3	0.4%	1	0.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	13	1.6%	6	2.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	19	2.4%	4	1.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	11	1.4%	1	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	3	0.4%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	2	0.3%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.1%	1	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	1	0.5%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	1	0.5%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.5%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.5%
100.328 Y-SUTURE TIP OPACITIES	1	0.1%	4	1.9%
100.330 GENERALIZED/ COMPLETE CATARACT	22	2.8%	1	0.5%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***113***	***14.3%***	***35***	***16.4%***
VITREOUS				
110.135 PHPV/ PTVL	0	0.0%	1	0.5%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.4%	7	3.3%
110.320 VITREOUS DEGENERATION SYNERESIS	35	4.4%	8	3.7%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	5	0.6%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	1	0.5%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	9	1.1%	0	0.0%

OCULAR DISORDERS REPORT
SILKY TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 788 #	 %	Year Examined: 2018-2022 Total # Dogs: 214 #	 %
RETINA Continued				
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
120.960 RETINOPATHY	0	0.0%	1	0.5%
OPTIC NERVE				
130.110 MICROPAPILLA	2	0.3%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	12	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED	24	3.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	11	1.4%	13	6.1%
NORMAL				
.000 NORMAL GLOBE	590	74.9%	151	70.6%

SKYE TERRIER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SKYE TERRIER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
SKYE TERRIER

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	9		5	
Diagnostic Name	**#**	**%**	**#**	**%**
EYELIDS				
25.110 DISTICHIASIS	1	11.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	11.1%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	8	88.9%	5	100.0%

SLOUGHI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- *rcd1a*	Autosomal recessive	2	NO	Mutation in the *PDE6B* gene

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Retinal atrophy

- generalized

A later onset degenerative disease of the retinal visual cells with visual deficits detectable at 2 to 3 years of age and which progresses to blindness. This abnormality may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. It is inherited as an autosomal recessive trait.

- rcd1a

In the Sloughi, the disease is due to an 8-bp insertion in exon 21 of the *PDE6B* gene causing the *rcd1a* form of PRA. The disease is genetically distinct from that in the Irish Setter and has a later age of onset. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Dekomien G, Runte M, Godde R, et al. Generalized progressive retinal atrophy of Sloughi dogs is due to an 8-bp insertion in exon 21 of the PDE6B gene. *Cytogenet Cell Gene*t. 2000;90:261-267.

OCULAR DISORDERS REPORT
SLOUGHI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 32 #	 %	2018-2022 68 #	 %
EYELIDS				
25.110 DISTICHIASIS	0	0.0%	2	2.9%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	3.1%	0	0.0%
UVEA				
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	6.3%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	3.1%	4	5.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	2	2.9%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	1.5%
100.306 PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	1.5%
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	1.5%
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	1	1.5%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***0***	***0.0%***	***5***	***7.4%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	3.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	1	3.1%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	31	96.9%	62	91.2%

SLOVAKIAN WIREHAIRED POINTER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SLOVAKIAN WIREHAIRED POINTER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
SLOVAKIAN WIREHAIRED POINTER

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	1		1	
Diagnostic Name	**#**	**%**	**#**	**%**
EYELIDS				
25.110 DISTICHIASIS	0	0.0%	1	100.0%
NORMAL				
.000 NORMAL GLOBE	1	100.0%	0	0.0%

SMALL MUNSTERLANDER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SMALL MUNSTERLANDER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
SMALL MUNSTERLANDER

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	18		9	
Diagnostic Name	**#**	**%**	**#**	**%**
EYELIDS				
22.000 ECTROPION, UNSPECIFIED	1	5.6%	0	0.0%
25.110 DISTICHIASIS	0	0.0%	1	11.1%
CORNEA				
70.700 CORNEAL DYSTROPHY	2	11.1%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	5.6%	2	22.2%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	11.1%	1	11.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	2	11.1%	1	11.1%
100.307 PUNCTATE CATARACT, CAPSULAR	0	0.0%	1	11.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	5.6%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***3***	***16.7%***	***2***	***22.2%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	5.6%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	12	66.7%	5	55.6%

SMOOTH FOX TERRIER*

*The Smooth Fox Terrier and the Wire Fox Terrier were originally considered two varieties of the same breed. They became separate breeds in 1985. It is likely that the same genetic diseases exist in both breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	1, 2	NO	
B.	Persistent pupillary membrane - iris - iris	Not defined	1	Breeder option	
C.	Lens luxation	Autosomal recessive	1, 3-7	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Martin CL and Wyman M. Primary glaucoma in the dog. *Vet Clin North Am*. 1978 May;8:257-286.

3. Lawson DD. Luxation of the crystalline lens in the dog. *J Small Anim Pract.* 1969;10:461.

4. Curtis R and Barnett KC. Primary lens luxation in the dog. *J Small Anim Pract*. 1980 Dec;21:657-668.

5. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract*. 1963;4:447.

6. Formston C. Observations on subluxation and luxation of the crystalline lens in the dog. *Journal of Comparative Pathology*. 1945;55:168.

7. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. Vet Ophthalmol. 2011; 14: 378-384.

OCULAR DISORDERS REPORT
SMOOTH FOX TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	299		87	
	Diagnostic Name	**#**	**%**	**#**	**%**
CORNEA					
70.700	CORNEAL DYSTROPHY	0	0.0%	1	1.1%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	14	4.7%	6	6.9%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.3%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.3%	1	1.1%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.3%	1	1.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.3%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	1.0%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.3%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	2	0.7%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	2	0.7%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***5***	***1.7%***	***0***	***0.0%***
VITREOUS					
110.320	VITREOUS DEGENERATION SYNERESIS	3	1.0%	1	1.1%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	2	0.7%	1	1.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	1.0%	0	0.0%
120.960	RETINOPATHY	0	0.0%	1	1.1%
OTHER					
900.000	OTHER, UNSPECIFIED	1	0.3%	0	0.0%
900.100	OTHER, NOT INHERITED	6	2.0%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	5	1.7%	1	1.1%
NORMAL					
.000	NORMAL GLOBE	263	88.0%	75	86.2%

SOFT-COATED WHEATEN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmos	Autosomal recessive	2, 3	NO	Mutation in the *RBP4* gene
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1, 4	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1, 4	NO	

Description and Comments

A. Microphthalmos

Microphthalmia is a congenital defect characterized by a small eye often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens and/or retina. A genetic test is available.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Kaukonen M, Woods S, Ahonen S. et al. Maternal inheritance of a recessive RBP for defect in canine congenital eyes disease. *Cell Reports* 2018; 23:2643–2652.

3. Kaukonen M, Woods S, Ahonen S, Lemberg S, Hellman M, Hytönen MK, Permi P, Glaser T, Lohi H. Maternal Inheritance of a Recessive RBP4 Defect in Canine Congenital Eye Disease. Cell Rep. 2018 May 29;23(9):2643-2652. doi: 10.1016/j.celrep.2018.04.118. PMID: 29847795; PMCID: PMC6546432.

4. Van der Woerdt A. Multiple ocular anomalies in two related litters of Soft-Coated Wheaten Terriers. *Prog Vet Comp Ophthal*. 1995;5:78.

OCULAR DISORDERS REPORT
SOFT COATED WHEATEN TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	7,828		1,150	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	0	0.0%	1	0.1%
10.000	GLAUCOMA	2	0.0%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	0	0.0%	1	0.1%
20.160	MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110	DISTICHIASIS	149	1.9%	27	2.3%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	10	0.1%	0	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	3	0.0%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	56	0.7%	5	0.4%
UVEA					
93.120	IRIS CYST	14	0.2%	1	0.1%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	3	0.0%	0	0.0%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	0	0.0%	1	0.1%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	267	3.4%	70	6.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	18	0.2%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	3	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	65	0.8%	54	4.7%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	7	0.1%	1	0.1%
95.120	CILIARY BODY CYST	4	0.1%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	0	0.0%	2	0.2%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	17	0.2%	2	0.2%
97.120	COLOBOMA	1	0.0%	0	0.0%
130.110	MICROPAPILLA	0	0.0%	2	0.2%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	2	0.2%
130.150	OPTIC DISC COLOBOMA	0	0.0%	4	0.3%
LENS					
100.200	CATARACT, UNSPECIFIED	24	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	369	4.7%	65	5.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	58	0.7%	26	2.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	11	0.1%	13	1.1%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	17	0.2%	5	0.4%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	10	0.1%	7	0.6%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	7	0.1%	4	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.1%	4	0.3%
100.307	PUNCTATE CATARACT, CAPSULAR	24	0.3%	18	1.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	35	0.4%	11	1.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	32	0.4%	6	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	21	0.3%	4	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.0%	2	0.2%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	14	0.2%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	20	0.3%	2	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	18	0.2%	7	0.6%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	5	0.4%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	4	0.3%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	3	0.0%	6	0.5%

OCULAR DISORDERS REPORT
SOFT COATED WHEATEN TERRIER

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 7,828 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,150 #	 %
LENS Continued					
100.330	GENERALIZED/ COMPLETE CATARACT	35	0.4%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.1%	1	0.1%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***334***	***4.3%***	***120***	***10.4%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	72	0.9%	8	0.7%
110.135	PHPV/ PTVL	6	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	11	0.1%	1	0.1%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	71	0.9%	3	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	4	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	14	0.2%	1	0.1%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	2	0.0%	0	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	14	0.2%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	5	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	9	0.1%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	49	0.6%	0	0.0%
900.100	OTHER, NOT INHERITED	184	2.4%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	86	1.1%	54	4.7%
NORMAL					
.000	NORMAL GLOBE	6,739	86.1%	866	75.3%

SPANISH GREYHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SPANISH GREYHOUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
SPANISH GREYHOUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2		1	
Diagnostic Name		**#**	**%**	**#**	**%**
NORMAL					
.000	NORMAL GLOBE	2	100.0%	1	100.0%

SPANISH MASTIFF

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SPANISH MASTIFF breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
SPANISH MASTIFF

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	1		0	
Diagnostic Name	**#**	**%**	**#**	**%**
NORMAL				
.000 NORMAL GLOBE	1	100.0%	0	

SPANISH WATER DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- early onset	Autosomal recessive	2	NO	Mutation in the *PDE6B* gene
	- *prcd*	Autosomal recessive	3	NO	Mutation in the *prcd* gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- early onset

A second, earlier onset form of PRA has also been identified recently in the Spanish Water Dog. The onset of visual deficits occurs at 2-3 years of age, and, dogs show advanced retinal degeneration at the time

visual deficits are recognized. The condition appears inherited as autosomal recessive. A DNA test is available.

- prcd

Studies have shown that one form of PRA in the Spanish Water Dog is PRCD which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and Data from OFA All-Breeds Report.

2. Winkler PA, Ramsey HD, Petersen-Jones SM. A novel mutation in PDE6B in Spanish Water Dogs with early-onset progressive retinal atrophy. Vet Ophthalmol. 2020 Sep;23(5):792-796. doi: 10.1111/vop.12792. Epub 2020 Jul 8. PMID: 32639685.

3. Personal communication on data from Optigen with Sue Pearce-Kelling

OCULAR DISORDERS REPORT
SPANISH WATER DOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	316		224	
	Diagnostic Name	#	%	#	%
EYELIDS					
25.110	DISTICHIASIS	3	0.9%	4	1.8%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.3%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	3	0.9%	0	0.0%
UVEA					
93.120	IRIS CYST	0	0.0%	1	0.4%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	13	4.1%	1	0.4%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	0	0.0%	1	0.4%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.3%	1	0.4%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	17	5.4%	10	4.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.3%	1	0.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.3%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.4%
100.306	PUNCTATE CATARACT, NUCLEUS	6	1.9%	9	4.0%
100.307	PUNCTATE CATARACT, CAPSULAR	2	0.6%	1	0.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.6%	1	0.4%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.3%	2	0.9%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.3%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.4%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	0.4%
100.330	GENERALIZED/ COMPLETE CATARACT	0	0.0%	1	0.4%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***14***	***4.4%***	***17***	***7.6%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.3%	2	0.9%
110.320	VITREOUS DEGENERATION SYNERESIS	2	0.6%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	8	2.5%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	4	1.3%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.3%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	8	2.5%	0	0.0%
FUNDUS					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.4%
130.110	MICROPAPILLA	0	0.0%	1	0.4%
OPTIC NERVE					
130.110	MICROPAPILLA	0	0.0%	1	0.4%
OTHER					
900.000	OTHER, UNSPECIFIED	4	1.3%	0	0.0%
900.100	OTHER, NOT INHERITED	7	2.2%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	12	3.8%	12	5.4%
NORMAL					
.000	NORMAL GLOBE	258	81.6%	188	83.9%

SPINONE ITALIANO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder options
D.	Cataract	Not defined	1	NO

Description and Comments

A. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
SPINONE ITALIANO

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,253 #	 %	Year Examined: 2018-2022 Total # Dogs: 346 #	 %
GLOBE				
.110 MICROPHTHALMIA	1	0.0%	0	0.0%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	3	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	31	1.4%	2	0.6%
22.000 ECTROPION, UNSPECIFIED	15	0.7%	4	1.2%
25.110 DISTICHIASIS	30	1.3%	7	2.0%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	3	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	3	0.1%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	0	0.0%	1	0.3%
UVEA				
90.250 PIGMENTARY UVEITIS	1	0.0%	0	0.0%
93.120 IRIS CYST	1	0.0%	0	0.0%
93.150 IRIS COLOBOMA	1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	103	4.6%	25	7.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	4	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	3	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	6	0.3%	3	0.9%
95.120 CILIARY BODY CYST	1	0.0%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	116	5.1%	20	5.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	13	0.6%	6	1.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	4	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	8	0.4%	3	0.9%
100.306 PUNCTATE CATARACT, NUCLEUS	22	1.0%	5	1.4%
100.307 PUNCTATE CATARACT, CAPSULAR	7	0.3%	3	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	14	0.6%	2	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	6	0.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	6	0.3%	1	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	6	0.3%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	14	0.6%	3	0.9%
100.317 INCIPIENT CATARACT, CAPSULAR	5	0.2%	2	0.6%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	5	0.2%	4	1.2%
100.330 GENERALIZED/ COMPLETE CATARACT	5	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***122***	***5.4%***	***26***	***7.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	0.1%	1	0.3%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	7	0.3%	1	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS	14	0.6%	0	0.0%

OCULAR DISORDERS REPORT
SPINONE ITALIANO

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,253 #	%	2018-2022 346 #	%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	10	0.4%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.0%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.0%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	22	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	62	2.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	27	1.2%	8	2.3%
NORMAL				
.000 NORMAL GLOBE	1,940	86.1%	274	79.2%

STABYHOUN

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the STABYHOUN breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
STABYHOUN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 5 #	 %	Year Examined: 2018-2022 Total # Dogs: 6 #	 %
CORNEA				
70.700 CORNEAL DYSTROPHY	0	0.0%	1	16.7%
LENS				
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	20.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	0	0.0%	2	33.3%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***1***	***20.0%***	***0***	***0.0%***
RETINA				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	20.0%	0	0.0%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	16.7%
NORMAL				
.000 NORMAL GLOBE	4	80.0%	3	50.0%

STAFFORDSHIRE BULL TERRIER*

*Please note that since 1972 the AKC considers the Staffordshire Bull Terrier a different breed from the American Staffordshire Terrier.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract				
	- generalized	Not defined	1	NO	
	- *HSF4*	Autosomal recessive	2-4	NO	Mutation in the *HSF4* gene
D.	Persistent hyperplastic primary vitreous (PHPV)	Not defined	1, 5, 6	NO	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

C. Cataract

- generalized

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except

in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

- HSF4

In the Staffordshire Bull Terrier, cataracts usually develop by one year of age. There is initial opacification of the suture lines progressing to nuclear and cortical cataract formation; complete cataracts and blindness develop by three years of age. The condition is inherited as an autosomal recessive mutation in the *HSF4* gene (*HSF4-1*). A DNA test is available.

D. Persistent hyperplastic primary vitreous (PHPV)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent tunica vasculosa lentis (PTVL) which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The majority of affected dogs have a retrolental fibrovascular plaque and variable lenticular defects which include posterior lenticonus/globus, colobomata, intralenticular hemorrhage and/or secondary cataracts. Vision impairment may result. The disease is an inherited disorder in the breed, but the mode of inheritance has not been defined. The results of current studies cannot rule out autosomal recessive or a dominant trait with incomplete penetrance.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract*. 1978;19:109-120.

3. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract*. 1985;26:305-316.

4. Mellersh CS, McLaughlin B, Ahonen S, et al. Mutation in HSF4 is associated with hereditary cataract in the Australian Shepherd. *Vet Ophthalmol*. 2009;12:372-378.

5. Curtis R, Barnett KC, Leon A. Persistent hyperplastic primary vitreous in the Staffordshire Bull Terrier. *Vet Rec*. 1984;115:385.

6. Leon A, Curtis R, Barnett K. Hereditary persistent hyperplastic primary vitreous in the Staffordshire Bull Terrier. *J Am Anim Hosp Assoc*. 1986;22:765-774.

OCULAR DISORDERS REPORT
STAFFORDSHIRE BULL TERRIER

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 1,005 #	 %	Year Examined: 2018-2022 Total # Dogs: 641 #	 %
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	0	0.0%	2	0.3%
25.110	DISTICHIASIS	84	8.4%	37	5.8%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	0	0.0%	1	0.2%
CORNEA					
70.220	PIGMENTARY KERATITIS	0	0.0%	1	0.2%
70.700	CORNEAL DYSTROPHY	4	0.4%	4	0.6%
UVEA					
93.120	IRIS CYST	5	0.5%	1	0.2%
93.170	ANTERIOR CHAMBER CYST	1	0.1%	1	0.2%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	27	2.7%	16	2.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.2%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	12	1.2%	16	2.5%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	1	0.2%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	38	3.8%	18	2.8%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	9	0.9%	10	1.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.3%	4	0.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	3	0.3%	2	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.3%	2	0.3%
100.307	PUNCTATE CATARACT, CAPSULAR	5	0.5%	6	0.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.3%	6	0.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	7	0.7%	5	0.8%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	5	0.5%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	2	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	4	0.4%	5	0.8%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.2%
100.328	Y-SUTURE TIP OPACITIES	3	0.3%	1	0.2%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.2%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***46***	***4.6%***	***45***	***7.0%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	4	0.4%	5	0.8%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	2	0.3%
110.320	VITREOUS DEGENERATION SYNERESIS	19	1.9%	4	0.6%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.3%
120.960	RETINOPATHY	0	0.0%	1	0.2%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.2%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	5	0.5%	3	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	6	0.6%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.1%	2	0.3%
OTHER					
900.000	OTHER, UNSPECIFIED	9	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	20	2.0%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	19	1.9%	30	4.7%

OCULAR DISORDERS REPORT
STAFFORDSHIRE BULL TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,005		641	
Diagnostic Name		**#**	**%**	**#**	**%**
NORMAL					
.000	NORMAL GLOBE	811	80.7%	505	78.8%

STANDARD SCHNAUZER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Y-suture tip opacity	Not defined	1	Breeder option
F.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

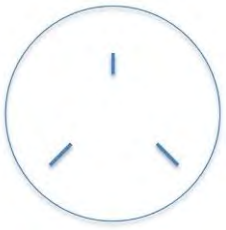
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and

affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

There are apparently several forms of cataracts in the Standard Schnauzer: 1) posterior cortex and posterior/total nucleus involvement, with slow progression; 2) dense posterior polar opacity near the sub-capsular region which progresses rapidly to very dense posterior polar plaques in young animals; 3) dense posterior polar opacity like that reported in young animals but found in older animals with variable progression.

E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
STANDARD SCHNAUZER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	3,338		638	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.0%	0	0.0%
10.000	GLAUCOMA	2	0.1%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.0%	0	0.0%
25.110	DISTICHIASIS	68	2.0%	4	0.6%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	0	0.0%	1	0.2%
51.100	THIRD EYELID CARTILAGE ANOMALY	2	0.1%	1	0.2%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.1%	0	0.0%
CORNEA					
70.220	PIGMENTARY KERATITIS	0	0.0%	1	0.2%
70.700	CORNEAL DYSTROPHY	27	0.8%	2	0.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA					
93.120	IRIS CYST	2	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	15	0.4%	2	0.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.1%	3	0.5%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	9	0.3%	8	1.3%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	0	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	2	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	123	3.7%	29	4.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	25	0.7%	15	2.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	9	0.3%	6	0.9%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.2%	4	0.6%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	4	0.1%	1	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	15	0.4%	5	0.8%
100.306	PUNCTATE CATARACT, NUCLEUS	10	0.3%	3	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR	19	0.6%	2	0.3%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	15	0.4%	5	0.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	12	0.4%	6	0.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	17	0.5%	6	0.9%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.1%	1	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	9	0.3%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	4	0.1%	4	0.6%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	1	0.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	8	0.2%	8	1.3%
100.330	GENERALIZED/ COMPLETE CATARACT	13	0.4%	1	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***167***	***5.0%***	***60***	***9.4%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	3	0.1%	4	0.6%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	5	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	13	0.4%	2	0.3%

OCULAR DISORDERS REPORT
STANDARD SCHNAUZER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,338 #	 %	Year Examined: 2018-2022 Total # Dogs: 638 #	 %
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	31	0.9%	1	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	4	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	24	0.7%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.2%
130.110 MICROPAPILLA	0	0.0%	4	0.6%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.2%
OPTIC NERVE				
130.110 MICROPAPILLA	5	0.1%	1	0.2%
130.120 OPTIC NERVE HYPOPLASIA	3	0.1%	1	0.2%
130.150 OPTIC DISC COLOBOMA	0	0.0%	1	0.2%
OTHER				
900.000 OTHER, UNSPECIFIED	31	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	71	2.1%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	41	1.2%	41	6.4%
NORMAL				
.000 NORMAL GLOBE	2,955	88.5%	524	82.1%

SUSSEX SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent hyaloid artery remnant	Not defined	1	Breeder option
D.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comments

A. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
SUSSEX SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 456 #	%	2018-2022 92 #	%
EYELIDS				
20.160 MACROPALPEBRAL FISSURE	23	5.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	1	0.2%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	32	7.0%	1	1.1%
25.110 DISTICHIASIS	24	5.3%	6	6.5%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.2%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	2	0.4%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	3	0.7%	0	0.0%
93.150 IRIS COLOBOMA	8	1.8%	1	1.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3	0.7%	3	3.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	7	1.5%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.4%	2	2.2%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	17	3.7%	1	1.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.2%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.2%	1	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	2	0.4%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.4%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	4	0.9%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	6	1.3%	6	6.5%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.4%	1	1.1%
100.328 Y-SUTURE TIP OPACITIES	1	0.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	2	0.4%	2	2.2%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***21***	***4.6%***	***10***	***10.9%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	39	8.6%	10	10.9%
110.135 PHPV/ PTVL	4	0.9%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	1	0.2%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	3	3.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	43	9.4%	2	2.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	2	0.4%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.2%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	1	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	3	0.7%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	10	2.2%	0	0.0%
900.100 OTHER, NOT INHERITED	20	4.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	7	1.5%	4	4.3%
NORMAL				
.000 NORMAL GLOBE	288	63.2%	60	65.2%

SWEDISH LAPPHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- *prcd*	Autosomal recessive	1	NO	Mutation in the *prcd* gene

Description and Comments

A. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Studies have shown that the principal form of PRA in the Swedish Lapphund is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Swedish Lapphund. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563. PMID: 16938425

OCULAR DISORDERS REPORT
SWEDISH LAPPHUND

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	3		11	
	Diagnostic Name	**#**	**%**	**#**	**%**
UVEA					
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	9.1%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	33.3%	0	0.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	33.3%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	33.3%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	33.3%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	1	33.3%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***3***	***100.0%***	***0***	***0.0%***
RETINA					
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	33.3%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	0	0.0%	10	90.9%

SWEDISH VALLHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Not defined	1	NO	
D.	Y suture tip opacities	Not defined	1	Breeder option	
E.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
F.	Retinopathy	Autosomal recessive	1-4	NO	Mutation in the *MERTK* gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

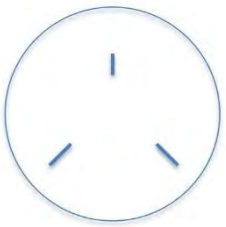
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

E. Vitreous degeneration - syneresis

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinopathy

Swedish Vallhunds have a unique form of retinal degeneration compared to most forms of PRA. The condition is multifocal rather than diffuse and the age of onset and rate of progression vary dramatically, even between littermates. The clinical signs progress in three stages. (A. Komaromy, personal communication 2016)

Stage one usually occurs between 2-3 years of age and is characterized by mottling or multifocal brown discoloration of the tapetal fundus – this should be marked as retinopathy even though visual deficits are not yet noted.

In stage two, geographic thinning of the retina can be seen and subtle night vision deficits are observed.

In stage three, the retinal thinning becomes more generalized with small islands of retinal sparing and deficits are noted in both photopic and scotopic vision. The disease has been associated with a mutation in the *MERTK* gene on canine chromosome 17. Dogs homozogous for the mutation have an 18 fold increased risk of developing the retinopathy. However, the actual causative mutation has not yet been identified.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Cooper AE, Ahonen S, Rowlan JS, et al. A novel form of progressive retinal atrophy in Swedish Vallhund dogs. *PloS one*. 2014;9:e106610.

3. Ahonen SJ, Arumilli M, Seppala E, et al. Increased expression of MERTK is associated with a unique form of canine retinopathy. *PloS one*. 2014;9:e114552.

4. Everson R, Pettitt L, Forman OP, et al. An intronic LINE-1 insertion in MERTK is strongly associated with retinopathy in Swedish Vallhund Dogs. PLoS one. 2017; 12(8):e0183021 PMID: 28813472

OCULAR DISORDERS REPORT
SWEDISH VALLHUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,587 #	 %	Year Examined: 2018-2022 Total # Dogs: 280 #	 %
EYELIDS				
20.140 ECTOPIC CILIA	1	0.1%	0	0.0%
25.110 DISTICHIASIS	38	2.4%	2	0.7%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.1%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	22	1.4%	2	0.7%
UVEA				
93.120 IRIS CYST	5	0.3%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	287	18.1%	60	21.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	10	0.6%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	7	0.4%	7	2.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
93.810 UVEAL MELANOMA	2	0.1%	0	0.0%
95.120 CILIARY BODY CYST	0	0.0%	1	0.4%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.1%	0	0.0%
120.960 RETINOPATHY	0	0.0%	8	2.9%
120.970 CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.4%
130.150 OPTIC DISC COLOBOMA	0	0.0%	10	3.6%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	232	14.6%	19	6.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	23	1.4%	8	2.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	8	0.5%	3	1.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	3	0.2%	3	1.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	37	2.3%	5	1.8%
100.306 PUNCTATE CATARACT, NUCLEUS	37	2.3%	10	3.6%
100.307 PUNCTATE CATARACT, CAPSULAR	8	0.5%	6	2.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	21	1.3%	6	2.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	5	0.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	10	0.6%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	4	0.3%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	6	0.4%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	18	1.1%	2	0.7%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	1	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.4%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	12	0.8%	12	4.3%
100.330 GENERALIZED/ COMPLETE CATARACT	7	0.4%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***190***	***12.0%***	***45***	***16.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	2	0.7%
110.135 PHPV/ PTVL	1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	11	0.7%	1	0.4%
110.320 VITREOUS DEGENERATION SYNERESIS	41	2.6%	6	2.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	24	1.5%	2	0.7%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	4	0.3%	2	0.7%

OCULAR DISORDERS REPORT
SWEDISH VALLHUND

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,587 #	 %	Year Examined: 2018-2022 Total # Dogs: 280 #	 %
RETINA Continued				
120.190 RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	45	2.8%	2	0.7%
120.960 RETINOPATHY	48	3.0%	7	2.5%
OPTIC NERVE				
130.110 MICROPAPILLA	3	0.2%	2	0.7%
130.150 OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	47	3.0%	0	0.0%
900.100 OTHER, NOT INHERITED	73	4.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	71	4.5%	17	6.1%
NORMAL				
.000 NORMAL GLOBE	975	61.4%	157	56.1%

TAMASKAN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	1	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
TAMASKAN

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 66 #	 %	Year Examined: 2018-2022 Total # Dogs: 76 #	 %
EYELIDS				
25.110 DISTICHIASIS	1	1.5%	1	1.3%
CORNEA				
70.700 CORNEAL DYSTROPHY	0	0.0%	3	3.9%
UVEA				
93.120 IRIS CYST	0	0.0%	1	1.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	1.5%	1	1.3%
95.120 CILIARY BODY CYST	1	1.5%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	1.5%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	1.5%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	1.5%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	1.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	1.5%	1	1.3%
100.327 INCOMPLETE CATARACT, CAPSULAR	1	1.5%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***5***	***7.6%***	***2***	***2.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	1.5%	0	0.0%
RETINA				
120.960 RETINOPATHY	1	1.5%	0	0.0%
OTHER				
900.100 OTHER, NOT INHERITED	0	0.0%	1	1.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	3.0%	2	2.6%
NORMAL				
.000 NORMAL GLOBE	56	84.8%	66	86.8%

TEDDY ROOSEVELT TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC TESTS AVAILABLE
A.	Lens luxation	Autosomal recessive	1	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Teddy Roosevelt Terrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011; 14: 378-384.

OCULAR DISORDERS REPORT
TEDDY ROOSEVELT TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 5 #	 %	Year Examined: 2018-2022 Total # Dogs: 8 #	 %
LENS				
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	1	20.0%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	20.0%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	20.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***3***	***60.0%***	***0***	***0.0%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	20.0%	0	0.0%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	40.0%	0	0.0%
NORMAL				
.000 NORMAL GLOBE	1	20.0%	8	100.0%

TENTERFIELD TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Tenterfield Terrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011; 14: 378-384.

OCULAR DISORDERS REPORT
TENTERFIELD TERRIER

There are no statistics available for this breed

TIBETAN MASTIFF

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
TIBETAN MASTIFF

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 64 #	 %	Year Examined: 2018-2022 Total # Dogs: 43 #	 %
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	3	4.7%	0	0.0%
22.000 ECTROPION, UNSPECIFIED	0	0.0%	1	2.3%
25.110 DISTICHIASIS	1	1.6%	4	9.3%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	1.6%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	8	12.5%	5	11.6%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	7.8%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	3.1%	1	2.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	1	1.6%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	1.6%	1	2.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	1.6%	1	2.3%
100.307 PUNCTATE CATARACT, CAPSULAR	1	1.6%	1	2.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	1	1.6%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	0	0.0%	2	4.7%
100.328 Y-SUTURE TIP OPACITIES	1	1.6%	2	4.7%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***5***	***7.8%***	***5***	***11.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	1	2.3%
OTHER				
900.000 OTHER, UNSPECIFIED	2	3.1%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	1.6%	3	7.0%
NORMAL				
.000 NORMAL GLOBE	46	71.9%	31	72.1%

TIBETAN SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Y-suture tip opacity	Not defined	1	Breeder option	
F.	Retinal atrophy				
	- *FAM161A*	Autosomal recessive	1-3	NO	Mutation in the *FAM161A* gene

Descriptions and Comments

A. Entropion

A conformational defect resulting in an "in rolling" of one or more of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

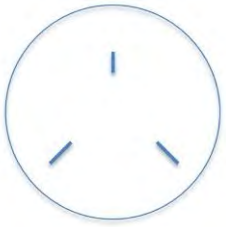
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Y-suture tip opacity

These are prominent (or "highlighted" or "more dense") distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a "peace sign" as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the "Lens" section of the CAER form. The newest version of the form (3/16/21) has boxes that say, "posterior Y-suture tip opacities" which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures" AND ALSO MARK "suspect not inherited/significance unknown" (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: "E2" or "posterior suture tip opacities." This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

F. Retinal atrophy - *FAM161A*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In most breeds PRA is inherited as an autosomal recessive trait.

In the Tibetan Spaniel, a mutation in *FAM161A* causes a later onset (4-5 years) of PRA. This form is being called progressive retinal atrophy 3 (PRA3) and appears to be the causative mutation in about 60% of Tibetan Spaniels with PRA. This form is inherited as an autosomal recessive trait. A DNA test for PRA3 is available. This test will not detect PRA caused by other genetic mutations. At least one other form of PRA appears to be present in the Tibetan Spaniel.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Bjerkas E. Progressive retinal atrophy in dogs in Norway. *Norsk Veterinaertidsskrift*. 1991;103:601-610.

3. Downs LM, Mellersh CS. An Intronic SINE insertion in FAM161A that causes exon-skipping is associated with progressive retinal atrophy in Tibetan Spaniels and Tibetan Terriers. *PLoS One*. 2014;9:e93990.

OCULAR DISORDERS REPORT
TIBETAN SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,382 #	%	2018-2022 362 #	%
GLOBE				
.110 MICROPHTHALMIA	2	0.1%	0	0.0%
EYELIDS				
20.140 ECTOPIC CILIA	4	0.1%	0	0.0%
20.160 MACROPALPEBRAL FISSURE	5	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED	90	2.7%	2	0.6%
22.000 ECTROPION, UNSPECIFIED	2	0.1%	0	0.0%
25.110 DISTICHIASIS	290	8.6%	15	4.1%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.3%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	2	0.1%	1	0.3%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	2	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	6	0.2%	1	0.3%
CORNEA				
70.210 PANNUS	8	0.2%	0	0.0%
70.220 PIGMENTARY KERATITIS	19	0.6%	3	0.8%
70.700 CORNEAL DYSTROPHY	10	0.3%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	1	0.0%	0	0.0%
93.120 IRIS CYST	2	0.1%	1	0.3%
93.150 IRIS COLOBOMA	4	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	66	2.0%	9	2.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	5	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	4	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	0.1%	5	1.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	0	0.0%
93.810 UVEAL MELANOMA	2	0.1%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	9	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	82	2.4%	10	2.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	5	0.1%	2	0.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	4	0.1%	1	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	13	0.4%	4	1.1%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR	5	0.1%	3	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	21	0.6%	1	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	12	0.4%	1	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	6	0.2%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	5	0.1%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS	8	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.1%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.3%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	11	0.3%	8	2.2%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%

OCULAR DISORDERS REPORT
TIBETAN SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,382 #	 %	Year Examined: 2018-2022 Total # Dogs: 362 #	 %
LENS Continued				
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***99***	***2.9%***	***14***	***3.9%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	8	0.2%	2	0.6%
110.135 PHPV/ PTVL	1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	13	0.4%	1	0.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	9	0.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.0%	3	0.8%
120.190 RETINAL DYSPLASIA, DETACHED	2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	29	0.9%	0	0.0%
120.960 RETINOPATHY	3	0.1%	2	0.6%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	2	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA	7	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	32	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	76	2.2%	1	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	40	1.2%	15	4.1%
NORMAL				
.000 NORMAL GLOBE	2,748	81.3%	294	81.2%

TIBETAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Lens luxation	Autosomal recessive	1, 2-7	NO	Mutation in the *ADAMTS17* gene
F.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- *FAM161A*	Autosomal recessive	1, 3, 8-11	NO	Mutation in the *FAM161A* gene
	- *prcd*	Autosomal recessive	12	NO	Mutation in the *prcd* gene
	- Rod-cone dysplasia (*rcd4*)	Autosomal recessive	14	NO	Mutation in the *C2orf71* gene
G.	Ceroid lipofuscinosis	Not defined	13, 14	NO	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

F. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky and Samoyed, in most breeds studied to date, PRA is inherited as an autosomal recessive trait.

- *FAM161A*

There are ERG studies to indicate that there is depression of the B wave at 10-12 weeks of age in the second variety and slower depression in the first variety. Some may have no obvious signs at 5-6 years of age, only to develop clinical signs at 6-7 years of age. It is logical that any animal found with signs of bilateral atrophy should not be bred. Members of the family of the affected animal should be carefully screened. Perhaps, ERG in animals less than 4 years of age is logical, especially if the animal is intended for breed foundation.

In the Tibetan Terrier a mutation in *FAM161A* causes a later onset (4-5 years) of PRA. This form is being called progressive retinal atrophy 3 (PRA3). This form is inherited as an autosomal recessive trait. A DNA test for PRA3 is available. This test will not detect PRA caused by other genetic mutations. At least one other form of PRA appears to be present in the Tibetan Terrier.

- *prcd*

Studies have shown that one form of PRA in the Tibetan Terrier is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night

blindness followed by day blindness. A DNA test is available.

- rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA initially identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A mutation-based gene test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and is of no value in identifying other forms of PRA.

G. Ceroid Lipofuscinosis

An inherited disease of man and animal characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease. In the Tibetan Terrier, moderate visual impairment can occur in low-light conditions.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Willis MB, Curtis R, Barnett KC, et al. Genetic aspects of lens luxation in the Tibetan Terrier. *Vet Rec*. 1979;104:409-412.

3. Barnett KC, Curtis R. Lens luxation and progressive retinal atrophy in the Tibetan Terrier. *Vet Rec*. 1978;103:160.

4. Curtis R, Barnett KC. Primary lens luxation in the dog. *J Small Anim Pract*. 1980;21:657-668.

5. Curtis R. Aetiopathological aspects of inherited lens dislocation in the Tibetan Terrier. *J Comp Pathol*. 1983;93:151-163.

6. Sargan DR, Withers D, Pettitt L, et al. Mapping the mutation causing lens luxation in several terrier breeds. *J Hered*. 2007;98:534-538.

7. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384.

8. Millichamp N, Curtis R, Barnett K. Progressive retinal atrophy in Tibetan Terriers. *J Am Vet Med Assoc*. 1988;192:769-776.

9. Dekomien G, Epplen JT. Exclusion of the PDE6A gene for generalised progressive retinal atrophy in 11 breeds of dog. *Anim Genet*. 2000;31:135-139.

10. Gramer L, Lagerman-Pekari M, Schauman P, et al. Progressiv retinal atrofi tibetansk terrier. *Svensk Veterinartidning*. 1974;24:158.

11. Downs LM, Mellersh CS. An Intronic SINE insertion in FAM161A that causes exon-skipping is associated with progressive retinal atrophy in Tibetan Spaniels and Tibetan Terriers. *PLoS One*. 2014;9:e93990.

12. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan

18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

13. Katz ML, Narfstrom K, Johnson GS, et al. Assessment of retinal function and characterization of lysosomal storage body accumulation in the retinas and brains of Tibetan Terriers with ceroid-lipofuscinosis. *Am J Vet Res*. 2005;66:67-76.

14. Drogemuller C, Wohlke A, Distl O. Characterization of candidate genes for neuronal ceroid lipofuscinosis in dog. *J Hered*. 2005;96:735-738.

OCULAR DISORDERS REPORT
TIBETAN TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 8,797 #	 %	2018-2022 930 #	 %
GLOBE				
.110 MICROPHTHALMIA	4	0.0%	0	0.0%
10.000 GLAUCOMA	3	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.1%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110 DISTICHIASIS	122	1.4%	7	0.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	3	0.0%	2	0.2%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	4	0.0%	0	0.0%
CORNEA				
70.220 PIGMENTARY KERATITIS	3	0.0%	1	0.1%
70.700 CORNEAL DYSTROPHY	91	1.0%	8	0.9%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	509	5.8%	69	7.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	22	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	40	0.5%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	10	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	47	0.5%	33	3.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	12	0.1%	4	0.4%
93.810 UVEAL MELANOMA	1	0.0%	0	0.0%
95.120 CILIARY BODY CYST	0	0.0%	1	0.1%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
97.120 COLOBOMA	1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	3	0.3%
130.120 OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.1%
LENS				
100.200 CATARACT, UNSPECIFIED	34	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	411	4.7%	60	6.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	127	1.4%	35	3.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	46	0.5%	1	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	18	0.2%	4	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	19	0.2%	9	1.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	10	0.1%	2	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS	15	0.2%	10	1.1%
100.307 PUNCTATE CATARACT, CAPSULAR	28	0.3%	9	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	70	0.8%	8	0.9%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	71	0.8%	6	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	37	0.4%	4	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	13	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	14	0.2%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS	11	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	6	0.1%	6	0.6%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	8	0.1%	5	0.5%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	5	0.1%	3	0.3%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	2	0.0%	3	0.3%

OCULAR DISORDERS REPORT
TIBETAN TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	8,797		930	
	Diagnostic Name	#	%	#	%
LENS Continued					
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	2	0.2%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	1	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	2	0.2%
100.328	Y-SUTURE TIP OPACITIES	1	0.0%	4	0.4%
100.330	GENERALIZED/ COMPLETE CATARACT	41	0.5%	1	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	2	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	17	0.2%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***577***	***6.6%***	***114***	***12.3%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	4	0.0%	3	0.3%
110.135	PHPV/ PTVL	2	0.0%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	7	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	34	0.4%	1	0.1%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	12	0.1%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	5	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	4	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	124	1.4%	0	0.0%
120.400	RETINAL HEMORRHAGE	3	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.1%
120.960	RETINOPATHY	8	0.1%	2	0.2%
OPTIC NERVE					
130.110	MICROPAPILLA	2	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	4	0.0%	1	0.1%
OTHER					
900.000	OTHER, UNSPECIFIED	82	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	149	1.7%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	74	0.8%	48	5.2%
NORMAL					
.000	NORMAL GLOBE	7,475	85.0%	716	77.0%

TOY AUSTRALIAN SHEPHERD

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris coloboma.

*Due to the breed's ancestry, most of the references cited here are for the Australian Shepherd and Miniature Australian Shepherd. The examiner may also find those breed pages as a helpful reference for other conditions that may occur but are not yet reported in the Toy Australian Shepherd.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DETECTED
A.	Microphthalmia with multiple ocular defects	Presumed autosomal recessive with incomplete penetrance	2-6	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Iris coloboma	Not defined		NO	
D.	Iris hypoplasia	Not defined	1	Breeder option	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
F.	Cataract				
	- *HSF4*	Autosomal co-dominant	1, 7, 8	NO	Mutation in the *HSF4-2* gene
G.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- (*prcd*)	Autosomal recessive	9	NO	Mutation in the *prcd* gene
H.	Cone degeneration - day blindness	Autosomal recessive	10	NO	Mutation in the *CNGB3* gene
I.	Multifocal retinopathy - *cmr1*	Autosomal recessive	11, 12	NO (Breeder option with normal DNA test for *BEST1* gene)	Mutation in the *BEST1* gene
J.	Choroidal hypoplasia (Collie Eye Anomaly) - Optic nerve coloboma - Retinal detachment - Retinal hemorrhage - Staphyloma/coloboma	Autosomal recessive	13-16	NO	Mutation in the *NHEJ1* gene

Description and Comments

A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye with associated defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (dysplasia). In the Australian Shepherd, microphthalmia has long been suspected to be associated with merled coat coloration but a definitive genetic relationship has not_been established. The eyes of affected homozygous merle (usually white) dogs have extreme forms of this entity and are usually blind at birth. Affected heterozygous merle-coated dogs demonstrate less severe manifestations.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Iris coloboma

A congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the OFA form.

D. Iris hypoplasia

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the OFA form.

E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Australian Shepherd, a mutation in *HSF4* (heat shock transcription factor 4), the HSF4-2 mutation, has been shown to increase the likelihood of cataract formation. The mutation is inherited in a co-dominant manner. Dogs with one copy of the mutation develop bilateral posterior cataracts and homozygotes develop a nuclear cataract that typically progresses to a mature cataract. A DNA test is available for this mutation. Other genetic factors can contribute to cataract formation in this breed and will not be detected by this test.

G. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- *prcd*

Unpublished data from genetics laboratories has shown that the principal form of PRA in the Australian Shepherd is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

H. Cone degeneration - day blindness or hemeralopia

Autosomal recessively inherited early degeneration of the cone photoreceptors (achromatopsia) has been reported in miniature Australian shepherds. To date, this has not yet been reported in the toy Australian shepherd. Affected puppies develop day-blindness, colorblindness, and photophobia between 8 and 12 weeks of age. Affected dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. Genetically, the condition results from a mutation in the *CNGB3* gene. A DNA test is available.

I. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression in the initial serous lesions after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs initially exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas, though the retina will continue to degenerate over time thus eventually causing vision impairment.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, Mastiff, Australian Shepherd and other breeds.

The breeding advice for Australian Shepherds diagnosed with “multifocal retinopathy” will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e. not a homozygous mutant, for the *BEST1* mutation.

J. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gelatt KN, McGill LD. Clinical characteristics of microphthalmia with colobomas of the Australian Shepherd Dog. *J Am Vet Med Assoc*. 1973;162:393-396. PMID: 4691375

3. Gelatt KN, Veith LA. Hereditary multiple ocular anomalies in Australian Shepherd dogs. *Vet Med Small Anim Clin*. 1970;65:39-42. PMID: 4984250

4. Cook CS, Burling K, Nelson EJ. Embryogenesis of posterior segment colobomas in the Australian Shepherd dog. *Prog in Vet Comp Ophthalmol*. 1991;1:163-170.

5. Bertram T, Coiqnoul F, Cheville N. Ocular dysgenesis in Australian Shepherd dogs. *J Am Anim Hosp Assoc*. 1984;20:177-182.

6. Gelatt KN, Powell NG, Huston K. Inheritance of microphthalmia with coloboma in the Australian Shepherd dog. *Am J Vet Res*. 1981;42:1686-1690. PMID: 7325429

7. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol*. 2006;9:369-378. PMID: 16939467

8. Mellersh CS, McLaughlin B, Ahonen S, et al. Mutation in HSF4 is associated with hereditary cataract in the Australian Shepherd. *Vet Ophthalmol*. 2009;12:372-378. PMID: 19883468

9. Personal communication on data from Optigen with Sue Pearce-Kelling

10. Yeh CY, Goldstein O, Kukekova AV, Holley D, Knollinger AM, Huson HJ, Pearce-Kelling SE, Acland GM, Komáromy AM. Genomic deletion of CNGB3 is identical by descent in multiple canine breeds and causes achromatopsia. BMC Genet. 2013 Apr 20;14:27. doi: 10.1186/1471-2156-14-27. PMID: 23601474

11. Hoffman I, Guziewicz KE, Zangler B, et al. Canine multifocal retinopathy in the Australian Shepherd: a case report. *Vet Ophthalmol*.2012;15:134-138. PMID: 22432598

12. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

13. Rubin LF, Nelson EJ, Sharp CA. Collie eye anomaly in Australian Shepherd dogs. *Prog in Vet Comp Ophthalmol*. 1991;1:105-108.

14 Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for ollie eye anomaly. *Genomics*. 2003;82:86-95. PMID: 12809679

15. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome research*. 2007;17:1562-1571. PMID: 17916641

16. Munyard KA, Sherry CR, Sherry L. A retrospective evaluation of congenital ocular defects in Australian Shepherd dogs in Australia. *Vet Ophthalmol*. 2007;10:19-22. PMID: 17204124. **reference derived from non-USA dog population**

OCULAR DISORDERS REPORT
TOY AUSTRALIAN SHEPHERD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,002 #	 %	Year Examined: 2018-2022 Total # Dogs: 200 #	 %
GLOBE				
.110 MICROPHTHALMIA	4	0.4%	0	0.0%
EYELIDS				
25.110 DISTICHIASIS	48	4.8%	9	4.5%
CORNEA				
70.700 CORNEAL DYSTROPHY	3	0.3%	1	0.5%
UVEA				
93.110 IRIS HYPOPLASIA	17	1.7%	9	4.5%
93.150 IRIS COLOBOMA	18	1.8%	4	2.0%
93.180 IIRIS SPHINCTER DYSPLASIA	3	0.3%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	109	10.9%	20	10.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	7	0.7%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.2%	2	1.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	0	0.0%	1	0.5%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
FUNDUS				
97.110 CHOROIDAL HYPOPLASIA	0	0.0%	1	0.5%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	13	1.3%	2	1.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.2%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.2%	2	1.0%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.1%	3	1.5%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	4	0.4%	1	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.1%	1	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***18***	***1.8%***	***7***	***3.5%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	5	0.5%	0	0.0%
110.135 PHPV/ PTVL	2	0.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	3	0.3%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	3	0.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.1%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	10	1.0%	1	0.5%
130.120 OPTIC NERVE HYPOPLASIA	2	0.2%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	6	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED	8	0.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	0.8%	8	4.0%
NORMAL				
.000 NORMAL GLOBE	845	84.3%	143	71.5%

TOY FOX TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Lens luxation	Autosomal recessive	2	NO	Mutation in the ADAMTS17 gene

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in ADAMTS17 has been associated with primary lens luxation. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. Vet Ophthalmol. 2011 Nov;14:378-384.

OCULAR DISORDERS REPORT
TOY FOX TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 211 #	 %	Year Examined: 2018-2022 Total # Dogs: 29 #	 %
EYELIDS				
25.110 DISTICHIASIS	2	0.9%	0	0.0%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	3.4%
CORNEA				
70.700 CORNEAL DYSTROPHY	1	0.5%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.5%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	0	0.0%	1	3.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	19	9.0%	2	6.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.9%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.5%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3	1.4%	1	3.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	1	3.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	5	2.4%	1	3.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.5%	1	3.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	3.4%
100.316 INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	3.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	2	6.9%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	3.4%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.5%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***6***	***2.8%***	***8***	***27.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	1	0.5%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.5%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS	3	1.4%	0	0.0%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	7	3.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2	0.9%	0	0.0%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	2	0.9%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	2	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	3	1.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	6	2.8%	2	6.9%
NORMAL				
.000 NORMAL GLOBE	169	80.1%	22	75.9%

TREEING WALKER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the TREEING WALKER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
TREEING WALKER

Diagnostic Name		Year Examined: 1993-2017 Total # Dogs: 7 #	 %	Year Examined: 2018-2022 Total # Dogs: 6 #	 %
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	14.3%	1	16.7%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	14.3%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	1	16.7%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***1***	***14.3%***	***1***	***16.7%***
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	28.6%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	5	71.4%	5	83.3%

VIZSLA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1, 2	NO
B.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine screening exam for certification.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol*. 2011 Mar;14:121-126.

OCULAR DISORDERS REPORT
VIZSLA

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,399 #	%	2018-2022 1,498 #	%
GLOBE				
10.000 GLAUCOMA	0	0.0%	1	0.1%
EYELIDS				
20.140 ECTOPIC CILIA	1	0.0%	1	0.1%
21.000 ENTROPION, UNSPECIFIED	3	0.1%	1	0.1%
22.000 ECTROPION, UNSPECIFIED	3	0.1%	0	0.0%
25.110 DISTICHIASIS	29	0.9%	13	0.9%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA	1	0.0%	1	0.1%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	4	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	7	0.2%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	49	1.4%	9	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
UVEA				
93.120 IRIS CYST	1	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	69	2.0%	40	2.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	13	0.4%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	124	3.6%	125	8.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	2	0.1%
95.120 CILIARY BODY CYST	1	0.0%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	4	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	120	3.5%	37	2.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	23	0.7%	12	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	17	0.5%	11	0.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	5	0.1%	4	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	6	0.2%	1	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS	7	0.2%	5	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR	27	0.8%	17	1.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	19	0.6%	7	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	28	0.8%	16	1.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	22	0.6%	7	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	4	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	3	0.1%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR	7	0.2%	3	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	4	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT	2	0.1%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***177***	***5.2%***	***84***	***5.6%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	4	0.1%	2	0.1%
110.135 PHPV/ PTVL	1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	6	0.2%	9	0.6%
110.320 VITREOUS DEGENERATION SYNERESIS	13	0.4%	2	0.1%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.1%

OCULAR DISORDERS REPORT
VIZSLA

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 3,399 #	 %	Year Examined: 2018-2022 Total # Dogs: 1,498 #	 %
FUNDUS Continued				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
120.960 RETINOPATHY	0	0.0%	1	0.1%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	3	0.1%	2	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	0.1%	0	0.0%
120.960 RETINOPATHY	4	0.1%	2	0.1%
OPTIC NERVE				
130.120 OPTIC NERVE HYPOPLASIA	1	0.0%	1	0.1%
OTHER				
900.000 OTHER, UNSPECIFIED	51	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED	74	2.2%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	77	2.3%	74	4.9%
NORMAL				
.000 NORMAL GLOBE	2,920	85.9%	1,179	78.7%

VOLPINO ITALIANO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1	NO	Mutation in the ADAMTS17 gene

Description and Comments

A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in ADAMTS17 has been associated with primary lens luxation. A DNA test is available.

References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Volpino Italiano. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. Vet Ophthalmol. 2011; 14: 378-384.

OCULAR DISORDERS REPORT
VOLPINO ITALIANO

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		0	
Diagnostic Name		**#**	**%**	**#**	**%**
NORMAL					
.000 NORMAL GLOBE		1	100.0%	0	

WACHTELHUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the WACHTELHUND breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
WACHTELHUND

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	2		0	
Diagnostic Name	**#**	**%**	**#**	**%**
NORMAL				
.000 NORMAL GLOBE	2	100.0%	0	

WEIMARANER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- *RPGR*	X-linked	2	NO	Mutation in the RPGR gene

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

In the Weimaraner, because there is significant clinical disease associated with the abnormal hairs, breeding should be discouraged.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

- *RPGR*

A recent study has shown that the principal form of PRA in the Weimaraner is a mutation in the Retinitis Pigmentosa GTPase Regulator (RPGR) gene, which was found have an X-linked inheritance pattern and appears to affect dogs at a younger age (~2.5 years in 3 affected males) in the current study. Other breeds have been shown to have a naturally occurring X-linked RP which include the Siberian husky and Samoyed breeds. The disease begins clinically with signs of night blindness.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Kropatsch R, Akkad D, Frank M, et al. A large deletion in RPGR causes XLPRA in Weimarener dogs. Canine Genetics and Epidemiol. 2016; 3:7.

OCULAR DISORDERS REPORT
WEIMARANER

Diagnostic Name	1993-2017 #	1993-2017 %	2018-2022 #	2018-2022 %
Year Examined:	**1993-2017**		**2018-2022**	
Total # Dogs:	**1,873**		**507**	
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	3	0.2%	0	0.0%
25.110 DISTICHIASIS	550	29.4%	127	25.0%
NASOLACRIMAL				
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.1%	1	0.2%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	14	0.7%	5	1.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	33	1.8%	6	1.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	5	0.3%	1	0.2%
UVEA				
93.120 IRIS CYST	5	0.3%	2	0.4%
93.150 IRIS COLOBOMA	2	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST	1	0.1%	1	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	15	0.8%	5	1.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	0.2%	7	1.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.1%	0	0.0%
93.810 UVEAL MELANOMA	1	0.1%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	107	5.7%	47	9.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	22	1.2%	23	4.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	7	0.4%	4	0.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	10	0.5%	7	1.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.1%	2	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS	13	0.7%	2	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR	8	0.4%	9	1.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	48	2.6%	13	2.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	14	0.7%	5	1.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	22	1.2%	8	1.6%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS	5	0.3%	7	1.4%
100.317 INCIPIENT CATARACT, CAPSULAR	2	0.1%	11	2.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.2%	1	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	1	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	2	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	0	0.0%	2	0.4%
100.328 Y-SUTURE TIP OPACITIES	1	0.1%	1	0.2%
100.330 GENERALIZED/ COMPLETE CATARACT	5	0.3%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***172***	***9.2%***	***95***	***18.7%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	4	0.2%	2	0.4%
110.135 PHPV/ PTVL	0	0.0%	2	0.4%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.1%	3	0.6%
110.320 VITREOUS DEGENERATION SYNERESIS	1	0.1%	3	0.6%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	2	0.1%	0	0.0%

OCULAR DISORDERS REPORT
WEIMARANER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,873 #	 %	Year Examined: 2018-2022 Total # Dogs: 507 #	 %
RETINA Continued				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	4	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	6	0.3%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.1%	0	0.0%
120.960 RETINOPATHY	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	12	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED	52	2.8%	2	0.4%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	34	1.8%	21	4.1%
NORMAL				
.000 NORMAL GLOBE	1,187	63.4%	289	57.0%

WELSH SHEEPDOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the WELSH SHEEPDOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
WELSH SHEEPDOG

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1		0	
Diagnostic Name		#	%	#	%
NORMAL					
.000	NORMAL GLOBE	1	100.0%	0	

WELSH SPRINGER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Presumed autosomal dominant	1-4	NO
B.	Entropion	Not defined	1	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
F.	Cataract	Presumed autosomal recessive	1, 5, 6	NO
G.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam. Due to the increased incidence of PLD in the breed and the increased progression observed with age, it may be prudent to perform repeated gonioscopy examinations over time.

Primary angle closure glaucoma has been reported in the Welsh Springer Spaniel. Females are affected more than males. Onset ranges from 10 weeks to 10 years. At the iridocorneal angle, the pectinate ligaments appear sparse and wispy in contrast to the sturdy fibers seen in other breeds. A dominant mode of inheritance is reported.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Welsh Springer Spaniel, lesions may be seen as early as 8-12 weeks of age and progress rapidly to complete cataract, impairing vision. A recessive mode of inheritance is reported.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Cottrell B, Barnett K. Primary glaucoma in the Welsh Springer Spaniel. *J Small Anim Pract*. 1988;29:185-199.

3. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111. Epub 2004/02/26.

4. Oliver JA, Ekiri A, Mellersh. Prevalence and Progression of Pectinate Ligament Dysplasia in the Welsh Springer Spaniel. J Sm Anim Pract. 2016;57: 416-421.

5. Barnett KC. Hereditary cataract in the Welsh Springer Spaniel. *J Small Anim Pract*. 1980;21:621-625. Epub 1980/11/01.

6. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract*. 1985;26:305.

OCULAR DISORDERS REPORT
WELSH SPRINGER SPANIEL

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2,885		619	
	Diagnostic Name	#	%	#	%
GLOBE					
10.000	GLAUCOMA	1	0.0%	0	0.0%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	48	1.7%	11	1.8%
22.000	ECTROPION, UNSPECIFIED	3	0.1%	0	0.0%
25.110	DISTICHIASIS	348	12.1%	100	16.2%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	3	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	55	1.9%	11	1.8%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
UVEA					
93.120	IRIS CYST	1	0.0%	1	0.2%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	1	0.2%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	662	22.9%	172	27.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.1%	5	0.8%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.0%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	6	0.2%	5	0.8%
95.120	CILIARY BODY CYST	1	0.0%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	0	0.0%
FUNDUS					
97.120	COLOBOMA	2	0.1%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	3	0.5%
130.110	MICROPAPILLA	0	0.0%	2	0.3%
LENS					
100.200	CATARACT, UNSPECIFIED	6	0.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	142	4.9%	29	4.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	22	0.8%	16	2.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	6	0.2%	4	0.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.0%	3	0.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	4	0.1%	5	0.8%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.1%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	8	0.3%	3	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR	8	0.3%	5	0.8%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	6	0.2%	1	0.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	5	0.2%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	4	0.1%	1	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.1%	2	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.2%
100.328	Y-SUTURE TIP OPACITIES	1	0.0%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***78***	***2.7%***	***41***	***6.6%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	10	0.3%	1	0.2%
110.135	PHPV/ PTVL	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	5	0.2%	0	0.0%

OCULAR DISORDERS REPORT
WELSH SPRINGER SPANIEL

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 2,885 #	 %	Year Examined: 2018-2022 Total # Dogs: 619 #	 %
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	31	1.1%	3	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	4	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	9	0.3%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	3	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	7	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	4	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	19	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED	53	1.8%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	34	1.2%	22	3.6%
NORMAL				
.000 NORMAL GLOBE	1,878	65.1%	326	52.7%

WELSH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
B.	Lens luxation	Autosomal recessive	1, 2	NO	Mutation in the *ADAMTS17* gene
C.	Y suture tip opacities	Not defined	1	Breeder option	

Description and Comment

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

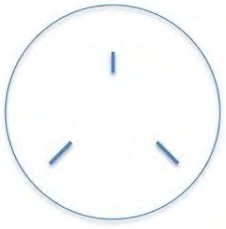
Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

B. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

C. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip

opacities." This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011 Nov;14:378-384.

OCULAR DISORDERS REPORT
WELSH TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	372		73	
	Diagnostic Name	**#**	**%**	**#**	**%**
GLOBE					
10.000	GLAUCOMA	1	0.3%	0	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	1	0.3%	0	0.0%
25.110	DISTICHIASIS	13	3.5%	1	1.4%
NASOLACRIMAL					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.3%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	4	1.1%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	3	0.8%	1	1.4%
UVEA					
93.170	ANTERIOR CHAMBER CYST	0	0.0%	1	1.4%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	30	8.1%	10	13.7%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.5%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.8%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	4	1.1%	14	19.2%
LENS					
100.200	CATARACT, UNSPECIFIED	1	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	22	5.9%	4	5.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.5%	1	1.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	2	0.5%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.3%	1	1.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.8%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	2	0.5%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.3%	1	1.4%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.5%	1	1.4%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	5	6.8%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.8%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***14***	***3.8%***	***4***	***5.5%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	1	1.4%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	1	0.3%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	6	1.6%	0	0.0%
900.100	OTHER, NOT INHERITED	13	3.5%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.3%	5	6.8%
NORMAL					
.000	NORMAL GLOBE	303	81.5%	45	61.6%

WEST HIGHLAND WHITE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Keratoconjunctivitis sicca	Not defined	1-4	NO
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 5	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Presumed autosomal recessive	1, 5	NO
D.	Y-suture tip opacity	Not defined	1	Breeder option
E.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

Description and Comments

A. Keratoconjunctivitis sicca

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

In the West Highland White Terrier, this disease has been reported more commonly in females than males.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the West Highland White Terrier, these membranes, when present, often bridge from the iris to the lens and may result in cataract with vision impairment.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The cataract described in the West Highland White Terrier initially involves the posterior Y sutures and may infrequently progress, resulting in vision impairment. The age of onset is less than 6 months of age. A recessive mode of inheritance is suggested by the pedigrees which have been studied.

D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.

These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Sansom J, Barnett KC, Neumann W, et al. Treatment of keratoconjunctivitis sicca in dogs with cyclosporine ophthalmic ointment: a European clinical field trial. *Vet Rec*. 1995; 137: 504-507.

3. Baker GJ, Formston C. An evaluation of transplantation of the parotid duct in the treatment of kerato-conjunctivitis sicca in the dog. *J Small Anim Pract*. 1968; 9: 261-268.

4. Kaswan RL, Martin CL, Chapman WL, Jr. Keratoconjunctivitis sicca: histopathologic study of nictitating membrane and lacrimal glands from 28 dogs. *Am J Vet Res*. 1984; 45: 112-118.

5. Narfstrom K. Cataract in the West Highland White Terrier. *J Small Anim Pract*. 1981; 22: 467-471.

OCULAR DISORDERS REPORT
WEST HIGHLAND WHITE TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,533		488	
	Diagnostic Name	**#**	**%**	**#**	**%**
GLOBE					
.110	MICROPHTHALMIA	5	0.3%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	3	0.2%	3	0.6%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.1%	1	0.2%
40.910	KERATOCONJUNCTIVITIS SICCA	3	0.2%	0	0.0%
CORNEA					
70.210	PANNUS	1	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	1	0.1%	1	0.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	3	0.2%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	133	8.7%	32	6.6%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	24	1.6%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.4%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	20	1.3%	9	1.8%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.3%	1	0.2%
LENS					
100.200	CATARACT, UNSPECIFIED	21	1.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	120	7.8%	40	8.2%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	23	1.5%	11	2.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	12	0.8%	5	1.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.3%	3	0.6%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	30	2.0%	17	3.5%
100.306	PUNCTATE CATARACT, NUCLEUS	11	0.7%	2	0.4%
100.307	PUNCTATE CATARACT, CAPSULAR	20	1.3%	17	3.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	37	2.4%	3	0.6%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	23	1.5%	7	1.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	5	0.3%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	5	0.3%	5	1.0%
100.316	INCIPIENT CATARACT, NUCLEUS	14	0.9%	6	1.2%
100.317	INCIPIENT CATARACT, CAPSULAR	11	0.7%	8	1.6%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	3	0.6%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.1%	2	0.4%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	4	0.3%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.2%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.2%
100.328	Y-SUTURE TIP OPACITIES	20	1.3%	26	5.3%
100.330	GENERALIZED/ COMPLETE CATARACT	30	2.0%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***257***	***16.8%***	***91***	***18.6%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.3%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	9	0.6%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	53	3.5%	4	0.8%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	3	0.2%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	16	1.0%	0	0.0%

OCULAR DISORDERS REPORT
WEST HIGHLAND WHITE TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,533 #	 %	Year Examined: 2018-2022 Total # Dogs: 488 #	 %
RETINA Continued				
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	2	0.1%	0	0.0%
120.960 RETINOPATHY	1	0.1%	0	0.0%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	8	1.6%
120.960 RETINOPATHY	0	0.0%	1	0.2%
OPTIC NERVE				
130.150 OPTIC DISC COLOBOMA	2	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	33	2.2%	0	0.0%
900.100 OTHER, NOT INHERITED	17	1.1%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	35	2.3%	16	3.3%
NORMAL				
.000 NORMAL GLOBE	1,109	72.3%	342	70.1%

WHIPPET

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Vitreous degeneration				
	- syneresis	Not defined	1, 2	Breeder option	
D.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Autosomal recessive	3	NO	Mutation in the *NHEJ1* gene
E.	Retinal atrophy				
	- generalized	Not defined	4	NO	

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment. This is a significant problem in the Whippet.

D. Choroidal hypoplasia (Collie Eye Anomaly)
- staphyloma/coloboma
- retinal detachment

- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly" and has been identified in the longhaired Whippet. The choroidal hypoplasia component is caused by a 7799 base pairs deletion with the gene *NHEJ1.* The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Krishnan, H., et al. (2020). "Vitreous degeneration and associated ocular abnormalities in the dog." Vet Ophthalmol 23(2): 219-224. PMID: 31464365

3. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome research*. 2007;17:1562-1571. Epub 2007/10/06.

4. Somma A, Moreno J, Sato M, et al. Characterization of a novel form of Progressive Retinal Atrophy in Whippet dogs: a clinical, electroretinographic, and breeding study. Vet Ophth. 2016: 1-10.

OCULAR DISORDERS REPORT
WHIPPET

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	12,091		3,067	
	Diagnostic Name	#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	1	0.0%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.0%
EYELIDS					
20.140	ECTOPIC CILIA	2	0.0%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110	DISTICHIASIS	9	0.1%	4	0.1%
NICTITANS					
50.210	PLASMOMA/ ATYPICAL PANNUS	1	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	5	0.0%	2	0.1%
70.700	CORNEAL DYSTROPHY	42	0.3%	8	0.3%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	6	0.0%	0	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	1	0.0%	1	0.0%
93.120	IRIS CYST	16	0.1%	5	0.2%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	2	0.0%	3	0.1%
93.180	IIRIS SPHINCTER DYSPLASIA	2	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	111	0.9%	57	1.9%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	10	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	11	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	16	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	9	0.1%	10	0.3%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	6	0.0%	3	0.1%
93.810	UVEAL MELANOMA	0	0.0%	1	0.0%
95.120	CILIARY BODY CYST	1	0.0%	4	0.1%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	19	0.2%	0	0.0%
97.120	COLOBOMA	4	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	4	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.1%
120.960	RETINOPATHY	0	0.0%	1	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	11	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	453	3.7%	125	4.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	87	0.7%	42	1.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	27	0.2%	9	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	50	0.4%	13	0.4%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	12	0.1%	4	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	21	0.2%	14	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	29	0.2%	18	0.6%
100.307	PUNCTATE CATARACT, CAPSULAR	22	0.2%	21	0.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	69	0.6%	22	0.7%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	41	0.3%	4	0.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	63	0.5%	12	0.4%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.0%	1	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	12	0.1%	1	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	17	0.1%	3	0.1%

OCULAR DISORDERS REPORT
WHIPPET

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 12,091 #	 %	2018-2022 3,067 #	 %
LENS Continued				
100.317 INCIPIENT CATARACT, CAPSULAR	21	0.2%	5	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	6	0.0%	2	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	5	0.0%	1	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	1	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS	0	0.0%	2	0.1%
100.328 Y-SUTURE TIP OPACITIES	17	0.1%	23	0.7%
100.330 GENERALIZED/ COMPLETE CATARACT	16	0.1%	2	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	34	0.3%	1	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***515***	***4.3%***	***177***	***5.8%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	20	0.2%	25	0.8%
110.135 PHPV/ PTVL	12	0.1%	1	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	120	1.0%	48	1.6%
110.320 VITREOUS DEGENERATION SYNERESIS	544	4.5%	70	2.3%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	33	0.3%	7	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	5	0.0%	4	0.1%
120.190 RETINAL DYSPLASIA, DETACHED	4	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	42	0.3%	8	0.3%
120.400 RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	4	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960 RETINOPATHY	9	0.1%	2	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	3	0.0%	1	0.0%
130.120 OPTIC NERVE HYPOPLASIA	3	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA	14	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	114	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED	233	1.9%	2	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	161	1.3%	158	5.2%
NORMAL				
.000 NORMAL GLOBE	10,638	88.0%	2,571	83.8%

WHITE SHEPHERD

There are insufficient breed eye screen examination statistics providing detailed descriptions of hereditary ocular conditions of the WHITE SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
WHITE SHEPHERD

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 43 #	 %	Year Examined: 2018-2022 Total # Dogs: 27 #	 %
CORNEA				
70.210 PANNUS	0	0.0%	2	7.4%
70.700 CORNEAL DYSTROPHY	4	9.3%	2	7.4%
UVEA				
93.170 ANTERIOR CHAMBER CYST	0	0.0%	1	3.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	2.3%	0	0.0%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.7%	2	7.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	3.7%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	1	2.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	2	4.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	1	2.3%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	1	2.3%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***4***	***9.3%***	***1***	***3.7%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	2.3%	0	0.0%
OPTIC NERVE				
130.110 MICROPAPILLA	1	2.3%	1	3.7%
130.120 OPTIC NERVE HYPOPLASIA	1	2.3%	0	0.0%
FUNDUS				
130.110 MICROPAPILLA	0	0.0%	1	3.7%
OTHER				
900.100 OTHER, NOT INHERITED	0	0.0%	1	3.7%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	4	9.3%	1	3.7%
NORMAL				
.000 NORMAL GLOBE	29	67.4%	18	66.7%

WHITE SWISS SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the WHITE SWISS SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
WHITE SWISS SHEPHERD

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	12		43	
	Diagnostic Name	**#**	**%**	**#**	**%**
CORNEA					
70.700	CORNEAL DYSTROPHY	0	0.0%	4	9.3%
UVEA					
93.170	ANTERIOR CHAMBER CYST	0	0.0%	1	2.3%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	8.3%	4	9.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	8.3%	2	4.7%
100.307	PUNCTATE CATARACT, CAPSULAR	1	8.3%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	1	2.3%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	2.3%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	5	11.6%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***2***	***16.7%***	***4***	***9.3%***
OTHER					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	2.3%
NORMAL					
.000	NORMAL GLOBE	11	91.7%	28	65.1%

WINDSPRITE

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the WINDSPRITE breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
WINDSPRITE

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 8 #	 %	Year Examined: 2018-2022 Total # Dogs: 90 #	 %
CORNEA				
70.700 CORNEAL DYSTROPHY	0	0.0%	1	1.1%
UVEA				
97.150 CHORIORETINAL COLOBOMA, CONGENITAL	0	0.0%	1	1.1%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	1.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	1	1.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	1.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***0***	***0.0%***	***3***	***3.3%***
VITREOUS				
110.320 VITREOUS DEGENERATION SYNERESIS	0	0.0%	1	1.1%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	2	2.2%
NORMAL				
.000 NORMAL GLOBE	8	100.0%	84	93.3%

WIRE FOX TERRIER*

*The Wire Fox Terrier and the Smooth Fox Terrier were originally considered two varieties of the same breed. They became separate breeds in 1985. It is likely that the same genetic diseases exist in both breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	1, 2	NO	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Lens luxation	Autosomal recessive	3	NO	Mutation in the *ADAMTS17* gene

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The cataracts observed in Wire Fox Terrier begin in the posterior subcapsular region and are progressive.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Martin CL, Wyman M. Primary glaucoma in the dog. *Vet Clin North Am*. 1978;8:257-286.

3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384.

OCULAR DISORDERS REPORT
WIRE FOX TERRIER

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	320		24	
	Diagnostic Name	**#**	**%**	**#**	**%**
GLOBE					
.110	MICROPHTHALMIA	1	0.3%	0	0.0%
EYELIDS					
25.110	DISTICHIASIS	8	2.5%	1	4.2%
CORNEA					
70.700	CORNEAL DYSTROPHY	3	0.9%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.3%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	108	33.8%	10	41.7%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	5	1.6%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	5	1.6%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.3%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	1	4.2%
LENS					
100.200	CATARACT, UNSPECIFIED	4	1.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	0.6%	0	0.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	3	0.9%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.3%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	5	1.6%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	5	1.6%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.6%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.3%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.3%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.3%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.3%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	8	2.5%	0	0.0%
100.345	***SIGNIFICANT CATARACTS (SUMMARY)***	***32***	***10.0%***	***0***	***0.0%***
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.3%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	1	0.3%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	1	0.3%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	4	1.3%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	3	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	12	3.8%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.3%	0	0.0%
NORMAL					
.000	NORMAL GLOBE	186	58.1%	13	54.2%

WIREHAIRED POINTING GRIFFON

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract				
	- generalized	Not defined	1	NO	
	- *fyco1*	Not defined	2	NO	Mutation of the *FYCO1* gene
D.	Y-suture tip opacity	Not defined	1	Breeder option	

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

- generalized

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

- FYCO1

A mutation in the FYCO1 gene has been associated with cataract in this breed.

D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.

These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures” AND ALSO MARK "suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Garces GR, Cristen M, Loechel, et al. FYCO1 frameshift deletion in Wirehaired Pointing Griffon dogs with juvenile cataract. *Genes (Basel)*; 2022 Feb; 13(2):334. PMID: 35205377

OCULAR DISORDERS REPORT
WIREHAIRED POINTING GRIFFON

Year Examined:	1993-2017		2018-2022	
Total # Dogs:	612		476	
Diagnostic Name	**#**	**%**	**#**	**%**
GLOBE				
.110 MICROPHTHALMIA	1	0.2%	0	0.0%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	3	0.5%	2	0.4%
25.110 DISTICHIASIS	6	1.0%	5	1.1%
NICTITANS				
51.100 THIRD EYELID CARTILAGE ANOMALY	1	0.2%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.2%	0	0.0%
CORNEA				
70.210 PANNUS	0	0.0%	1	0.2%
70.700 CORNEAL DYSTROPHY	1	0.2%	1	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	3	0.5%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	1	0.2%	1	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	10	1.6%	10	2.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.2%	6	1.3%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	47	7.7%	30	6.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	13	2.1%	13	2.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.5%	2	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	2	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.2%	1	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.7%	2	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS	10	1.6%	6	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR	4	0.7%	2	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.5%	4	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	5	0.8%	1	0.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.2%	2	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS	6	1.0%	2	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR	0	0.0%	2	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	2	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES	5	0.8%	7	1.5%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***50***	***8.2%***	***42***	***8.8%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	9	1.9%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.3%	4	0.8%
110.320 VITREOUS DEGENERATION SYNERESIS	5	0.8%	4	0.8%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.2%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	5	0.8%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	0.2%	0	0.0%
120.400 RETINAL HEMORRHAGE	1	0.2%	0	0.0%
120.960 RETINOPATHY	0	0.0%	1	0.2%
OTHER				
900.000 OTHER, UNSPECIFIED	6	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	3	0.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	16	2.6%	18	3.8%
NORMAL				
.000 NORMAL GLOBE	521	85.1%	387	81.3%

WIREHAIRED VIZSLA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
B.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

OCULAR DISORDERS REPORT
WIREHAIRED VIZSLA

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 152 #	 %	Year Examined: 2018-2022 Total # Dogs: 132 #	 %
EYELIDS				
25.110 DISTICHIASIS	0	0.0%	1	0.8%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	3	2.0%	0	0.0%
CORNEA				
70.700 CORNEAL DYSTROPHY	0	0.0%	1	0.8%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	11	7.2%	6	4.5%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	13	8.6%	9	6.8%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	21	13.8%	7	5.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	6	3.9%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.7%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.7%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	2	1.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS	1	0.7%	3	2.3%
100.307 PUNCTATE CATARACT, CAPSULAR	7	4.6%	2	1.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	2	1.5%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.8%
100.316 INCIPIENT CATARACT, NUCLEUS	1	0.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	0	0.0%	2	1.5%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.8%
100.328 Y-SUTURE TIP OPACITIES	1	0.7%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***19***	***12.5%***	***11***	***8.3%***
VITREOUS				
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.7%	1	0.8%
110.320 VITREOUS DEGENERATION SYNERESIS	1	0.7%	0	0.0%
RETINA				
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.7%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	4	2.6%	0	0.0%
900.100 OTHER, NOT INHERITED	0	0.0%	1	0.8%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	7	4.6%	6	4.5%
NORMAL				
.000 NORMAL GLOBE	115	75.7%	101	76.5%

WORKING KELPIE

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the WORKING KELPIE breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
WORKING KELPIE

	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	0		2	
Diagnostic Name		**#**	**%**	**#**	**%**
NORMAL					
.000	NORMAL GLOBE	0		2	100.0%

XOLOITZCUINTLI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- *prcd*	Autosomal recessive	2	NO	Mutation in the *prcd* gene

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Retinal atrophy

- generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

- prcd

Studies have shown that the principal form of PRA in the Xoloitzcuintli is *prcd* which is a form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT
XOLOITZCUINTLI

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 82 #	 %	2018-2022 177 #	 %
EYELIDS				
25.110 DISTICHIASIS	1	1.2%	1	0.6%
CORNEA				
70.220 PIGMENTARY KERATITIS	0	0.0%	1	0.6%
UVEA				
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	4	4.9%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	1.2%	6	3.4%
LENS				
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	1.2%	7	4.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	0	0.0%	4	2.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	1	1.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	5	2.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	3	3.7%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	7	8.5%	1	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	3	3.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR	3	3.7%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	1	1.2%	1	0.6%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***17***	***20.7%***	***10***	***5.6%***
VITREOUS				
110.320 VITREOUS DEGENERATION SYNERESIS	0	0.0%	2	1.1%
FUNDUS				
120.170 RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.6%
RETINA				
120.180 RETINAL DYSPLASIA, GEOGRAPHIC	1	1.2%	0	0.0%
OTHER				
900.100 OTHER, NOT INHERITED	1	1.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	5	2.8%
NORMAL				
.000 NORMAL GLOBE	67	81.7%	152	85.9%

YAKUTIAN LAIKA

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the YAKUTIAN LAIKA breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT
YAKUTIAN LAIKA

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 7 #	 %	Year Examined: 2018-2022 Total # Dogs: 26 #	 %
UVEA				
93.120 IRIS CYST	1	14.3%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	14.3%	0	0.0%
LENS				
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	3.8%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	3.8%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***0***	***0.0%***	***2***	***7.7%***
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	1	14.3%	0	0.0%
OTHER				
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	3.8%
NORMAL				
.000 NORMAL GLOBE	6	85.7%	24	92.3%

YORKSHIRE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Keratoconjunctivitis sicca	Not defined	1, 2	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Lens luxation	Autosomal recessive	3-5	NO	Mutation in the *ADAMTS17* gene
F.	Vitreous degeneration	Not defined	1	Breeder option	
	-syneresis				
G.	Retinal atrophy				
	- generalized	Not defined	1	NO	

Description and Comment

A. Keratoconjunctivitis sicca

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment. There is evidence that Yorkshire Terriers sometimes present with severe, congenital, unilateral keratoconjunctivitis sicca (KCS) and it is suspected this is due to hypoplasia or aplasia of the gland.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision

impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

F. Vitreous degeneration - syneresis

A liquefaction of the vitreous gel which may predispose to retinal detachment.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Herrera HD, Weichsler N, Gomez JR, et al. Severe, unilateral, unresponsive keratoconjunctivitis sicca in 16 juvenile Yorkshire Terriers. *Vet Ophthalmol.* 2007;10:285-288.

3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011;14:378-384.

4. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010;51:4716-4721.

5. Walde I. Retinal and corneal dysplasias in the Yorkshire Terrier and other breeds in Austria. *Tiereztliche Praxix.* 1997;25:62.

OCULAR DISORDERS REPORT
YORKSHIRE TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,828 #	%	2018-2022 803 #	%
GLOBE				
.110 MICROPHTHALMIA	5	0.3%	1	0.1%
10.000 GLAUCOMA	1	0.1%	0	0.0%
EYELIDS				
21.000 ENTROPION, UNSPECIFIED	0	0.0%	1	0.1%
25.110 DISTICHIASIS	37	2.0%	6	0.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
NASOLACRIMAL				
40.910 KERATOCONJUNCTIVITIS SICCA	6	0.3%	1	0.1%
NICTITANS				
52.110 PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
CORNEA				
70.210 PANNUS	4	0.2%	0	0.0%
70.220 PIGMENTARY KERATITIS	4	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY	15	0.8%	2	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
UVEA				
93.110 IRIS HYPOPLASIA	1	0.1%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	180	9.8%	52	6.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	4	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	20	1.1%	12	1.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.1%	0	0.0%
LENS				
100.200 CATARACT, UNSPECIFIED	23	1.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	56	3.1%	9	1.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX	38	2.1%	12	1.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX	13	0.7%	1	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.3%	2	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES	5	0.3%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES	6	0.3%	3	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS	3	0.2%	2	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR	1	0.1%	5	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX	29	1.6%	19	2.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX	18	1.0%	17	2.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX	18	1.0%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES	3	0.2%	19	2.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES	3	0.2%	21	2.6%
100.316 INCIPIENT CATARACT, NUCLEUS	3	0.2%	12	1.5%
100.317 INCIPIENT CATARACT, CAPSULAR	1	0.1%	1	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX	5	0.3%	6	0.7%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.1%	3	0.4%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.1%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES	2	0.1%	1	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT	29	1.6%	1	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)	***208***	***11.4%***	***129***	***16.1%***
VITREOUS				
110.120 PERSISTENT HYALOID ARTERY/ REMNANT	2	0.1%	3	0.4%

OCULAR DISORDERS REPORT
YORKSHIRE TERRIER

Diagnostic Name	Year Examined: 1993-2017 Total # Dogs: 1,828 #	 %	2018-2022 803 #	 %
VITREOUS Continued				
110.135 PHPV/ PTVL	4	0.2%	1	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER	7	0.4%	7	0.9%
110.320 VITREOUS DEGENERATION SYNERESIS	17	0.9%	7	0.9%
RETINA				
120.170 RETINAL DYSPLASIA, FOLDS	8	0.4%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	55	3.0%	2	0.2%
120.920 RETINAL DETACHMENT WITH DIALYSIS	1	0.1%	1	0.1%
120.960 RETINOPATHY	5	0.3%	0	0.0%
FUNDUS				
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
120.920 RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.1%
OPTIC NERVE				
130.110 MICROPAPILLA	1	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA	3	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
OTHER				
900.000 OTHER, UNSPECIFIED	19	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED	26	1.4%	2	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	32	1.8%	25	3.1%
NORMAL				
.000 NORMAL GLOBE	1,373	75.1%	624	77.7%