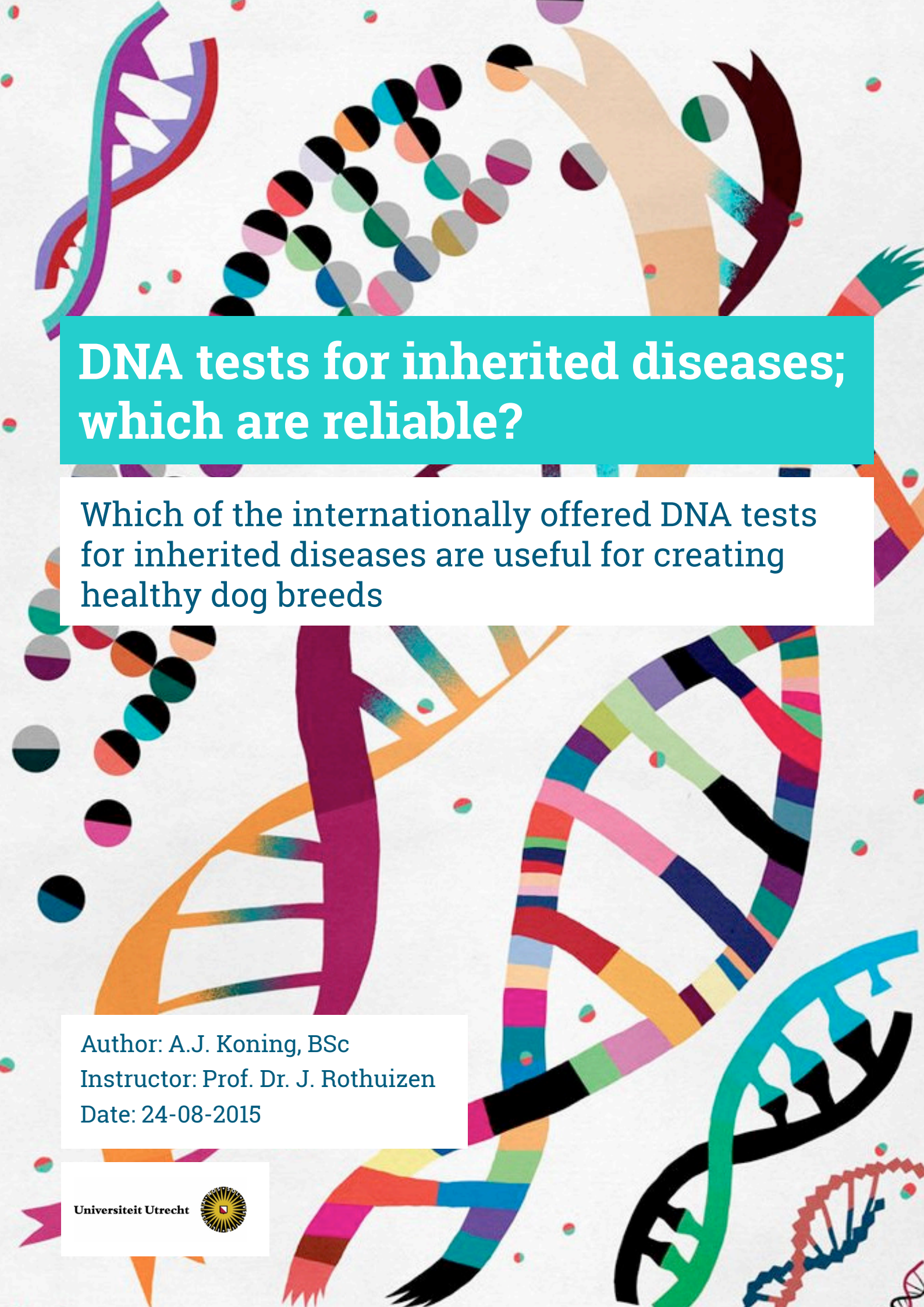

# DNA tests for inherited diseases; which are reliable?

## Which of the internationally offered DNA tests for inherited diseases are useful for creating healthy dog breeds

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## Abstract

Inherited diseases in purebred dogs are a well-known problem to dog breeders and veterinarians. Because there are so many DNA tests offered internationally this project tries to examine which of the DNA tests are useful and which are not. The goal is to compose a list of all these tests to help the breeders and veterinarians make a well-considered decision on which test to use. This is realized through a set of criteria to qualify the DNA tests which is also established in this project. In the end it shows that not all offered DNA tests are useful for the disease or breed it claims is useful for.

## Introduction

Inherited diseases are the most common health and welfare problems in purebred animals. There is a lot of attention for this problem on TV, the radio and in the newspapers. Because of all this attention it has become a subject on the political agenda, as a result the 'Wet Dieren' has been changed (chapter 2, section 1, article 2.6, clause 2c). Since 1st of July 2014 breeders are required to do everything possible to produce healthy offspring,

Inherited diseases are caused by one or more mutation(s) in the DNA. The presence of some of these mutations in individual animals can be shown by DNA tests. The most effective way to breed healthy animals is by testing the parental animals for the DNA mutations that are associated with genetic diseases. In this way it is possible to select a combination of parental animals which will produce offspring that is clinically healthy for the examined disease. . Another important application of DNA diagnostics for veterinarians, is that they can diagnose the genetic susceptibility of individuals in a population at young age, often before the onset of clinical disease. This permits the veterinarian to design an individual health program to prevent or decrease the clinical stage of the disease.

There are many DNA tests on the market, some of these tests are trustworthy but quite a few are not substantiated or even completely unsuited. For the veterinarian, who has to apply the test, and for the breeder, who has to convert the outcome into a proper breeding policy, it is difficult to know which tests to use for reliable results. By reviewing a portion of the available tests in a scientifically sound manner it is possible to make a list of reliable tests, which can be used by veterinarians and breeders. The 'Expertisecentrum Genetica Gezelschapsdieren' of the faculty of veterinary medicine will publish this list on www.Diergeneeskunde.nl so that the veterinarian and breeder can co-operate to keep purebred animals as healthy as possible and will also create a website where one can apply for DNA tests. If breeders do not use the suitable tests on the list and breed unhealthy animals, the consequence is that they

are liable for damages because of the previously mentioned law.

This project focusses on the development of criteria to review the quality of online offered DNA tests. In addition there will be criteria developed to determine when the proper tests are effective to use in practice and when they are useless. Based on these criteria a list of tests will be selected to indicate which tests are useful to use in breeding programs.
This project furthermore consists of collecting DNA tests offered on the internet and scientifically review the validity of these tests. There are about 100 tests for different inherited diseases. This is too much to cover in one research so there will be selected a few laboratories which offer DNA tests to determine which are reliable.

## Materials and methods

First, there was a system of rules developed to evaluate the scientifically based suitability of DNA tests for the breed populations in the Netherlands.
All inherited diseases on the list were divided per organ system in two definite lists, one for each research project. This research includes skeletal and muscle, kidney and urine, neurological, skin, sex and respiratory diseases. Each reference per disease was checked to determine if the references on Penngen were valid. To qualify the tests there must be paid attention to the different factors that make a trustworthy DNA test, such as what kind of test it is and if it is based on published literature. In order to establish a final list of DNA tests with the conclusion on which are reliable and which are not, it is necessary to make a list of criteria to review all the tests equally.

Then the website from Penngen(1) was viewed to get an idea of how many laboratories there are worldwide which offer genetic tests for inherited diseases in purebred dogs. It became obvious that there are so many laboratories which offer genetic tests that it was necessary to make a selection of a few laboratories that are relevant for the Netherlands. Van Haeringen(2) was chosen because it is a Dutch laboratory which makes it clearly relevant for the Dutch market. Laboklin(3) was chosen because it is a German laboratory which makes is also relevant for the Dutch dog population. Finally, Vetgen(4) and Optigen(5) were chosen because they both are large laboratories with a large offer of genetic tests.

Next, each of these websites was looked at to see which DNA tests for inherited diseases they offered and for which dog breed specifically. All this information has been put together in an overview that is on alphabetical order of the breeds
(Appendix 1).
When this list was finished the four laboratories were contacted through the email address indicated on their website. In this email a few questions were asked, for example on which

literature their DNA tests were based (Appendix 2). Laboklin, Vetgen and Optigen replied back to this email. (Appendix 3)

Finally, the offered DNA tests were qualified with help of the developed criteria. These tests were brought together in a final list organized per organ system.
The final list can be found in Appendix 4. If the reference shown on UPenn was not sufficient or simply absent, the available literature was studied to determine whether or not the test was suitable for the specific breeds claimed by the laboratories.

## Results

The following criteria have been developed to determine if a DNA test is suitable for testing.

- Is it a mutation test or a marker test? A mutation test is more reliable than a marker test.
- Is the test based on literature and if so, where can it be found? If the test is based on published literature it has been proven that the test is qualified to detect the mutation.
- For which breed is the test applicable? Is the mutation causing the disease described in this breed? Not every disease occurs in every breed and not every disease is caused by the same mutation in each breed.

- How does the mutation inherit? If the disease inherits in a dominant way and is expressed before the age suitable for breeding, it has no added value to test these dogs. This is because breeders would never breed with a dog who has a disease.
- Which country does the test come from? A test from a foreign county does not necessarily have to be applicable to the dog population in the Netherlands.

The list in appendix 4 shows the diseases per organ system and the different breeds who can be tested for a disease according to the laboratories. 'Penngen article' indicates that the reference comes from Penngen. 'Own article' indicates that the reference shown on Penngen was not sufficient or simply absent. Between brackets the specific reason for finding an own article is given.

The green coloured word 'good' before a disease or breed means the article is sufficient, the breed(s) and the gene(s) are correct.
The red coloured word 'wrong' before a disease or breed means the article is not sufficient, with the specific reason behind it.

## Discussion

All of the DNA tests in the list are mutation test, except for the test for the disease Necrotizing Meningoencephalitis (NME) in the pug, which is a marker based test. Because marker tests are not as reliable as mutation tests, the tests for NME is not recommended.

Most of the tests are based on published literature. However a few are not, for example Neuroaxonal Dystrophy (NAD) in the Giant

Schnauzer. This disease cannot be found in the literature for this breed. Another downside of the criterium that the test has to be based on published literature is that it is easy to overlook literature which is hard to find or which is not published yet (on the internet). This means it may occur that tests could be mistakenly classified as 'wrong'.
Not every test is suitable for the breed that it is offered for. If the mutation is found in a breed a laboratory sometimes offers the test for related breeds. This is the case for Cerebellar Ataxia/Neuronal Ceroid Lipofuscinosis 4A, where the same article is used for both American Staffordshire Terriers (AST) as for American Pitbull Terriers (APT). However, the article is only about the AST breed, so to assume that it is also applicable to the APT breed is wrong.
The same applies to Neuronal Ceroid Lipofuscinosis 8, where an article about English Setters is used for both English as Irish Setters although these are two distinct breeds.

In at least one case the test is not suitable because of the way the mutation inherits. This is the test for Osteogenesis Imperfecta in the Beagle. Because it inherits in a dominant manner it has no added value to test the dogs. It is a very serious condition where the dogs who are affected will not live a very long time plus the dog can be diagnosed immediately after birth, therefore breeders will never breed with these dogs.

This project focusses only on the dog population in the Netherlands, however a lot of the literature that is used to qualify the DNA tests come from foreign countries. Although it is reasonable to assume that the mutation causing a disease in a dog breed in, for example, America is the same mutation in the Netherlands, it is not a hundred percent solid. This is because the dog population in, for example, America is a different population than the one in the Netherlands.
An idea for a follow up research project would be to collect all DNA tests mentioned in this project and test dogs in the Netherlands to see if they really are valid in practice.

## Conclusion

The criteria developed in this project have made it possible to qualify DNA tests and separate the right from the wrong. Reasons for these incorrect tests are variable, it can be because the test is a marker based test or the test is not based on published literature. Another reason is because the disease is -not yet- known in the breed it is offered for, or because it is simply not useful to test for the disease due to the way the mutation inherits. In conclusion it is safe to say that most DNA tests for inherited diseases in purebred dogs are reliable, however definitely not all. Therefore it is important to do proper research when applying for a DNA test.

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| | *Disease* | *Mono/poly, recessive/dominant* | *Mutation* | *Which lab* | *Results Time/Price* |
|---|---|---|---|---|---|
| *All Breeds* | Canine degenerative myelopathy (DM) | Autosomaal recessive | SOD1-gene | Laboklin | 3-5 days |
| | | | SOD1-gene | Van Haeringen | <20 days € 79,50 |
| | Hiplaxity 1/2 | Multifactorial origin | | Van Haeringen | <10 days € 39,50 |
| | Hyperuricemia (HUU) | Autosomal recessive | SLC2A9 Gene | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 3-5 days |
| | Maligant hyperthermia (MH) | Autosomal dominant | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | Multidrug Resistance 1 (MDR1) | Autosomal recessive | MDR1 Gene | Van Haeringen | <10 days € 80,00 |
| | Polycythemia | Autosomal dominant | JAK2 Gene | Van Haeringen | <10 days € 39,50 |
| | Thrombasthenia 2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *Airedale Terrier* | Faktor VII - Deficiency | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | VetGen | $65.00 USD |
| | Hemophilia B (Facort IX deficiency) | X-linked recessive | | VetGen | $65.00 USD |
| *Alaskan Klee Kai* | Faktor VII - Deficiency | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | VetGen | $65.00 USD |
| *Alaskan malamute* | Polyneuropathy 1 | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| | Cone Degeneration (CD) | Autosomal recessive | CNGB3 Gene | Optigen | |
| *American Bulldog* | Neuronal ceroid lipofuscinosis (NCL) 10 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | CSTD Gene | VetGen | $65.00 USD |
| | Canine Multi-focal Retinopathy (CMR) | Autosomal recessive | VMD2 Gene | Optigen | US$95.00 |
| *American Cocker Spaniel* | Phosphofructokinase deficiency (PFKD) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |

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| | FN (Familial Nephropathy) | Autosomal recessive | | Van Haeringen | <10 days € 110,00 |
| *American Eskimo Dog* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| | Thrombopathia 2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *American Hairless Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *American Pitbull Terrier* | Cerebellar Ataxia / Neuronal ceroid lipofuscinosis (NCL), 4A | Autosomal recessive | | Optigen | 3-4 weeks $150 |
| | Cone Rod Dystrophy 2 (CRD2) | Autosomal recessive | | Optigen | <2 weeks $120 |
| *American Staffordshire Terrier* | Cerebellar Ataxia / Neuronal ceroid lipofuscinosis (NCL), 4A | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | Optigen | 3-4 weeks $150 |
| | Cone Rod Dystrophy 2 (CRD2) | Autosomal recessive | | Van Haeringen | <25 days € 100,00 |
| | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| *Australian Cattle Dog* | Cystinuria | Autosomal dominant | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| | Myotonia Congenita 2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | rcd4 Progressive Retinal Atrophy (rcd4 PRA) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | C2orf71 Gene | Optigen | $95 |
| | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Australian Shepherd* | CMR1 (Canine Multifocal Retinopathy) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | BEST1 gene | VetGen | $65.00 USD |
| | | | VMD2 Gene | Optigen | US$95.00 |

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| | Collie Eye Anomalie (CEA) | Autosomal recessive | | Laboklin | 4-6 weeks |
| | | | chromosome number 37 | Optigen | $180 |
| | Cyclic Neutropenia (CN) | Autosomal recessive | | VetGen | $65.00 USD |
| | Hereditary Cataract (HC) | Autosomal dominant | HSF4 Gene | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | Autosomal co-dominant | HSF4-2 Gene | Optigen | $100 |
| | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| | Ivermectin hypersensitivity (MDR1 gene defect) | Autosomal recessive | mdr1 gene | Laboklin | 1-2 weeks |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | Cone Degeneration (CD) | Autosomal recessive | CNGB3 Gene | Optigen | $160 |
| *Australian Silky Terrier* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| *Australian Stumpy Tail Cattle Dog* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | prcd Gene | Optigen | $195 |
| *Basenjis* | Pyruvate kinase deficiency (PK) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| | | | | Optigen | $80 |
| | Basenji Progressive Retinal Atrophy (bas PRA) | Autosomal recessive | | Optigen | $95 |
| *Basset* | Thrombopathia | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | X-linked severe combined Immunodeficiency (X-SCID) | X-Chromosomal | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| *Beagle* | Factor VII deficiency | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 3-5 days |
| | | | | VetGen | $65.00 USD |
| | Primary open angle glaucoma (POAG) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | ADAMTS10 | Optigen | $95 |
| | Musladin-Lueke syndrome (MLS) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 3-5 days |

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| | Cobalamin Malabsorption/cubilin deficiency | Autosomal recessive | | Laboklin | 3-5 weeks |
| | Neonatal cortical cerebellar abiotrophy (NCCD) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| | Osteogenesis Imperfecta | Autosomal dominant | | Van Haeringen | <10 days € 39,50 |
| | Pyruvate kinase Deficiency 3 (PKDef) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| *Bearded Collie* | Collie Eye Anomalie (CEA) | Autosomal recessive | | Laboklin | 4-6 weeks |
| | | | | Van Haeringen | <25 days € 140,00 |
| | | | chromosome number 37 | Optigen | $180 |
| *Bedlington Terriers* | Copper toxicosis | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | | Commd1 | VetGen | $65.00 USD |
| *Bernese Mountain Dog* | Von-Willebrands Disease Type 1 | Autosomal dominant variable penetrance | | Van Haeringen | <10 days € 89,00 |
| | | | | Laboklin | 3-5 days |
| | | | | VetGen | Within 2 weeks $65.00 USD |
| *Bichon Frise* | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *Black Russian Terrier* | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| *Boerboel* | CMR1 (Canine Multifocal Retinopathy) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | VMD2 Gene | Optigen | US$95.00 |
| | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| *Bolonka Zwetna* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | prcd Gene | Optigen | $195 |
| *Border Collie* | Collie Eye Anomalie (CEA) | Autosomal recessive | | Laboklin | 4-6 weeks |
| | | | | Van Haeringen | <25 days € 140,00 |
| | | | chromosome number 37 | Optigen | $180 |
| | Ivermectin hypersensitivity (MDR1 gene defect) | Autosomal recessive | Mdr1 gene | Laboklin | 1-2 weeks |
| | Neuronal ceroid lipofuscinosis (NCL) 5 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |

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| | | | | Optigen | $95 |
| | Trapped Neutrophil Syndrome (TNS) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | Optigen | $95 |
| | Cobalamin Malabsorption/cubilin deficiency | Autosomal recessive | cubilin gene | Optigen | $95 |
| *Boston Terrier* | Hereditary Cataract 2 (HSF4) | Autosomal recessive | HSF4 Gene | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | HSF4 Gene | VetGen | $65.00 USD |
| | | | HSF4-1 Gene | Optigen | $100 |
| | Cobalamin Malabsorption/cubilin deficiency | Autosomal recessive | | Laboklin | 3-5 weeks |
| *Boxer* | Macrothrombocytopenia (MTC) | autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *Boykin Spaniel* | Collie Eye Anomalie (CEA) | Autosomal recessive | | Laboklin | 4-6 weeks |
| | | | chromosome number 37 | Optigen | $180 |
| | Exercise induced collapse (EIC) | Autosomal recessive | DNM1 gene | Laboklin | 3-5 days |
| *Brazilian Terrier* | Mucopolysaccharidose Type VII - 2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| *Briard* | Congenital stationary night blindness (CSNB) | Autosomal recessive | RPE65 gene | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | | RPE65 Gene | Optigen | $135 |
| *Braittany Spaniel* | C3 Deficiency | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *Bull Dog* | Canine Multifocal Retinopathy (CMR1 & CMR2) | Autosomal recessive | BEST1 gene | VetGen | $65.00 USD |
| | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| *Bull Mastiff* | Canine Multifocal Retinopathy (CMR1 & CMR2) | Autosomal recessive | BEST1 gene | VetGen | $65.00 USD |
| | | | VMD2 Gene | Optigen | US$95.00 |
| | Dominant Progressive Retinal Atrophy (PRA) | Autosomal dominant | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | Optigen | About 2 weeks $120 |
| *Bull Terrier* | Polycystic kidney disease (PKD1) | Autosomal dominant | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |

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| | Hemophilia B (Facort IX deficiency) | X-linked recessive | | VetGen | $65.00 USD |
| *Cairn Terrier* | Globoid Cell Leukodystrophy / Krabbes Disease | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | Pyruvate kinase deficiency (PK) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| | Hemophilia B (Facort IX deficiency) | X-linked recessive | | VetGen | $65.00 USD |
| *Cane Corsos* | CMR1 (Canine Multifocal Retinopathy) | Autosomal recessive | | van Haeringen | <10 days € 39,50 |
| | | | BEST1 gene | VetGen | $65.00 USD |
| | | | VMD2 Gene | Optigen | US$95.00 |
| *Cardigen Welsh Corgi* | rcd3 Progressive Retinal Atrophy (rcd3 PRA) | Autosomal recessive | | van Haeringen | <10 days € 39,50 |
| | | | | VetGen | $65.00 USD |
| | | | PDE6A Gene | Optigen | $80 |
| *Cavalier King Charles Spaniel* | Dry eye curly coat syndrome (CCS) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | Episodic Falling (EF) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <20 days € 59,50 |
| | Muscular dystrophy (MD) | X-chromosomal-recessive | | Laboklin | 1-2 weeks |
| | Thrombocytopaenia | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *Chesapeake Bay Retriever* | Ectodermal dysplasia/Skin fragility syndrome (ED/SFS) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | Exercise induced collapse (EIC) | Autosomal recessive | DNM1 gene | Laboklin | 3-5 days |
| | | | DNM1 gene | Van Haeringen | <20 days € 59,50 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Chihuahua* | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *Chinese Crested Dog* | Canine Multiple System Degeneration (CMSD) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |

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| | | | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| | Von-Willebrands Disease Type 2 | Autosomal recessive | | VetGen | $65.00 USD |
| | rcd3 Progressive Retinal Atrophy (rcd3 PRA) | Autosomal recessive | PDE6A Gene | Optigen | $80 |
| *Chinese Foo Dog* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Clumber Spaniel* | Pyruvate Dehydrogenase Phosphatase 1 (PDP1) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| *Cockapoo* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | Phosphofructokinase deficiency (PFKD) | Autosomal recessive | | Optigen | $80 |
| *English Cocker Spaniel* | Familial Nephropathy (FN) | Autosomal recessive | | Van Haeringen | <10 days € 110,00 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | prcd Gene | Optigen | $195 |
| | Phosphofructokinase deficiency (PFKD) | Autosomal recessive | | VetGen | $65.00 USD |
| | | | | Optigen | $80 |
| | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *Collies* | Gray Collie Syndrome (Cyclic Neutropenia) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Collie Eye Anomaly (CEA) | Autosomal recessive | | Van Haeringen | <25 days € 140,00 |
| | | | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| | | | chromosome number 37 | Optigen | $180 |
| | Ivermectin hypersensitivity (MDR1 gene defect) | Autosomal recessive | mdr1 gene | Laboklin | 1-2 weeks |
| | rcd2 Progressive Retinal Atrophy (rcd2 PRA) | Autosomal recessive | | Van Haeringen | <25 days € 187,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | Optigen | $180 |
| | Von-Willebrands Disease Type 2 | Autosomal recessive | | VetGen | $65.00 USD |
| *Coton de Tulear* | Bandara's Neonatal Ataxia (BNAt) | Autosomal recessive | GRM1 gene | VetGen | $65.00 USD |

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| | | | | Van Haeringen | <10 days € 39,50 |
| | CMR2 (Canine Multifocal Retinopathy) | Autosomal recessive | | van Haeringen | <10 days € 39,50 |
| | | | BEST1 gene | VetGen | $65.00 USD |
| | | | VMD2 Gene | Optigen | US$95.00 |
| | Von-Willebrands Disease Type 1 | Autosomal dominant (variable penetrance) | | Van Haeringen | <10 days € 89,00 |
| | | | | Laboklin | 3-5 days |
| | | | | VetGen | Within 2 weeks $65.00 USD |
| *Curly Coated Retrievers* | Exercise induced collapse (EIC) | Autosomal recessive | DNM1 gene | Laboklin | 3-5 days |
| | | | DNM1 gene | Van Haeringen | <20 days € 59,50 |
| | Glycogen Storage Disease GSD Type IIIa (GSDIIIa) | Autosomal recessive | AGL Gene | Van Haeringen | <20 days € 44,50 |
| | | | | Laboklin | 1-2 weeks |
| | Cone-Rod Dystrophy 1-PRA (Cord1-PRA) | Autosomal recessive | | VetGen | $65.00 USD |
| *Czechoslovakian Wolfdog* | Pituitary dwarfism | Autosomal recessive | | Van Haeringen | <20 days € 69,50 |
| | | | | Laboklin | 1-2 weeks |
| *Dachshund* | Osteogenesis Imperfecta | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| | Cone Rod Dystrophy 4-PRA (CRD4-PRA) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Cone-Rod Dystrophy 1-PRA (Cord1-PRA) | Autosomal recessive | | VetGen | $65.00 USD |
| | Progressive retinal atrophy (crd-PRA) | Autosomal recessive | NPHP4 gene | Laboklin | 1-2 weeks |
| | Mucopolysaccharidosis Type IIIa | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Narcolepsy | Autosomal recessive | | Van Haeringen | <20 days € 49,50 |
| | | | Hcrtr2 Gene | Optigen | $130 |
| | Neuronal ceroid lipofuscinosis (NCL) 1/2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| *Dalmation* | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| *Doberman Pincher* | Albinism (White) | Autosomal recessive | OCA4 gene | VetGen | $65.00 USD |
| | | | SLC45A2 | Optigen | $80 |
| | Dilated Cardiomyopathy | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | VetGen | $65.00 USD |

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| | Narcolepsy | Autosomal recessive | | Van Haeringen | <20 days € 49,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | Hcrtr2 Gene | Optigen | $130 |
| | Von-Willebrands Disease Type 1 | Autosomal dominant (variable penetrance) | | Van Haeringen | <10 days € 89,00 |
| | | | | VetGen | Within 2 weeks $65.00 USD |
| | | | | Laboklin | 3-5 days |
| *Dogue de Bordeaux* | Canine Multi-focal Retinopathy (CMR) | Autosomal recessive | VMD2 Gene | Optigen | US$95.00 |
| *Drentsche Patrijshond* | Von-Willebrands Disease Type 1 | Autosomal dominant (variable penetrance) | | Van Haeringen | <10 days € 89,00 |
| | | | | VetGen | Within 2 weeks $65.00 USD |
| | | | | Laboklin | 3-5 days |
| *Dutch Kooiker* | Von Willebrand disease 3 - 2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| *Dwarf Poodle* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *English Bulldog* | Canine Multifocal Retinopathy (CMR1 & CMR2) | Autosomal recessive | BEST1 gene | VetGen | $65.00 USD |
| *English Cocker Spaniel* | Familial Nephropathy (FN) | Autosomal recessive | | Van Haeringen | <10 days € 110,00 |
| | | | | Laboklin | 1-2 weeks |
| | | | | Optigen | $95 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | prcd Gene | Optigen | $195 |
| | | | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | Phosphofructokinase deficiency (PFKD) | Autosomal recessive | | VetGen | $65.00 USD |
| | | | | Optigen | $80 |
| | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *English Mastiff* | Dominant Progressive Retinal Atrophy (PRA) | Autosomal dominant | | Laboklin | 1-2 weeks |
| | Canine Multifocal Retinopathy (CMR1 & CMR2) | Autosomal recessive | BEST1 gene | VetGen | $65.00 USD |
| *English Setter* | Neuronal ceroid lipofuscinosis (NCL) 8 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |

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| | | | | Laboklin | 1-2 weeks |
| | | | CSTD gene | VetGen | $65.00 USD |
| | rcd4 Progressive Retinal Atrophy (rcd4 PRA) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | C2orf71 Gene | Optigen | $95 |
| *English Shepherd* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | prcd Gene | Optigen | $195 |
| *English Springer Spaniel* | Fucosidosis | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 102 weeks |
| | Familial Nephropathy (FN) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | Phosphofructokinase deficiency (PFKD) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| | | | | Optigen | $80 |
| | Cone-Rod Dystrophy 1-PRA (Cord1-PRA) | Autosomal recessive | | VetGen | $65.00 USD |
| | Tremor, X-linked | X-Chromosomal | | Van Haeringen | <10 days € 39,50 |
| *English Toy Spaniel* | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *Entlebucher Mountain Dog* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Farm Collie* | rcd2 Progressive Retinal Atrophy (rcd2 PRA) | Autosomal recessive | | Van Haeringen | <25 days € 187,50 |
| *Finnish Hound* | Cerebellar Ataxia, progressive early-onset | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | SEL1L gene | Laboklin | 1-2 weeks |
| | Glycogen storage disease type II (Pompe Disease) | Autosomal recessive | | Laboklin | 1-2 weeks |
| *Finnish Lapphund* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *French Bulldog* | Hereditary cataract (HC) | Autosomal recessive | HSF4 gene | Laboklin | 1-2 weeks |
| | | | HSF4 Gene | VetGen | $65.00 USD |
| | | | HSF4-1 Gene | Optigen | $100 |
| *Frisian Water Dogs* | SCID 2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *Fox Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| *German Pinscher* | Von-Willebrands Disease Type 1 | Autosomal dominant (variable penetrance) | | Van Haeringen | <10 days € 89,00 |
| | | | | VetGen | Within 2 weeks $65.00 USD |

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| | | | | Laboklin | 3-5 days |
| *German Pointer* | Junctional epidermolysis bullosa (JEB) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | Von-Willebrands Disease Type 2 | Autosomal recessive | | Van Haeringen | <10 days € 69,00 |
| | | | | VetGen | $65.00 USD |
| | | | | Laboklin | 3-5 days |
| | Hemophilia B (Facort IX deficiency) | X-linked recessive | | VetGen | $65.00 USD |
| *German Shepherd* | Canine Leukocyte Adhesion Deficiency (CLAD), Type 3 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| | Mucopolysaccharidosis Type VII | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | Ivermectin hypersensitivity (MDR1 gene defect) | Autosomal recessive | mdr1 gene | Laboklin | 1-2 weeks |
| | Pituitary dwarfism | Autosomal recessive | | Van Haeringen | <20 days € 69,50 |
| | | | | Laboklin | 1-2 weeks |
| | Renal Cystadenocarcinoma and Nodular Dermatofibrosis | Autosomal dominant | | VetGen | $65.00 USD |
| | | | | Van Haeringen | <10 days € 39,50 |
| *German Shorthaired Pointer* | Cone Degeneration | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | CNGB3 Gene | Optigen | $160 |
| *German Spaniel* | Phosphofructokinase deficiency (PFKD) | Autosomal recessive | | Laboklin | 1-2 weeks |
| *German Spitz* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | prcd Gene | Optigen | $195 |
| *German WIrehaired Pointer* | Hemophilia B (Facort IX deficiency) | X-linked recessive | | VetGen | $65.00 USD |
| | Von-Willebrands Disease Type 2 | Autosomal recessive | | VetGen | $65.00 USD |
| *Giant Schnauzer* | Factor VII - Deficiency | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | VetGen | $65.00 USD |
| | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| | Neuroaxonal dystrophy (NAD) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Glen of Imaal Terrier* | Cone Rod Dystrophy 3 (CRD3) | Autosomal recessive | | Van Haeringen | <25 days € 100,00 |
| | | | ADAM9 Gene | Optigen | $120 |

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| *Golden Retriever* | Epidermolysis bullosa, dystrophic (RDEB) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | GR PRA1 (Progressive Retinal Atrophy) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | Optigen | $100 |
| | GR PRA2 (Progressive Retinal Atrophy) | Autosomal recessive | | Optigen | $100 |
| | Ichthyosis 2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Optigen | $120 |
| | Muscular Dystrophy (GRMD) | X-Chromosomal | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Gordon Setter* | Cerebellar Ataxia 2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | rcd4 Progressive Retinal Atrophy (rcd4 PRA) | Autosomal recessive | | van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | C2orf71 Gene | Optigen | $95 |
| *Great Dane* | Centronuclear Myopathy (cnm) | Autosomal recessive | | Laboklin | 3-5 days |
| *Great Pyrenees* | CMR1 (Canine Multifocal Retinopathy) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | VMD2 Gene | Optigen | US$95.00 |
| *Great Swiss Mountain Dog* | Bleeding disorder due to P2RY12 defect | Mono, autosomaal recessief | P2RY12 Gene | Van Haeringen | <10 days € 39,50 |
| *Greyhound* | Hereditary polyneuropathy (HN) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | | | VetGen | $65.00 USD |
| | | | NDRG1 gene | Optigen | $95 |
| *Havanese* | Haemophilia A (Factor VIII) | X-Chromosomal | | Van Haeringen | <20 days € 49,50 |
| | | | | Laboklin | 2-5 days |
| | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *Hokkaido* | Collie Eye Anomalie (CEA) | Autosomal recessive | | Laboklin | 4-6 weeks |
| | | | | Van Haeringen | <25 days € 140,00 |
| | | | chromosome number 37 | Optigen | $180 |

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| *Husky* | GM1-Gangliosidosis | Autosomal recessive | | Laboklin | 1-2 weeks |
| *Irish Setters* | Canine Leukocyte Adhesion Deficiency (CLAD), Type 1 | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | | | Optigen | $135 |
| | Globoid cell leukodystrophy (Krabbe disease) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | Neuronal ceroid lipofuscinosis (NCL) 8 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | rcd1 Progressive Retinal Atrophy (rcd1 PRA) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | Optigen | $120 |
| | | | PDEB gene | VetGen | $65.00 USD |
| | rcd4 Progressive Retinal Atrophy (rcd4 PRA) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | C2orf71 Gene | Optigen | $95 |
| *Irish Terrier* | Digital Hyperkeratosis (Corny Feet) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| *Irish Wolfhound* | Startle Disease or Hyperekplexia | Autosomal recessive | | Laboklin | 1-2 weeks |
| *Italian Greyhound* | IG PRA1 (Progressive Retinal Atrophy) | Autosomal Dominant with Incomplete Penetrance | | Optigen | $105 |
| *Jack Russell Terrier* | Late onset ataxia (LOA) | Autosomal recessive | (CAPN1)-gene | Laboklin | 1-2 weeks |
| | Primary Lens Luxation (PLL) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 3-5 days |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| | SCID | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| | Spinocerebellar ataxia (SCA) | Autosomal recessive | | Laboklin | 3-5 days |
| *Jagd Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Karerlian Beardog* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |

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| | | | prcd Gene | Optigen | $195 |
| *Kerry Blue Terrier* | Canine Multiple System Degeneration (CMSD) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | Von-Willebrands Disease Type 1 | Autosomal dominant (variable penetrance) | | Van Haeringen | <10 days € 89,00 |
| | | | | VetGen | Within 2 weeks $65.00 USD |
| | | | | Laboklin | 3-5 days |
| *Kelpie* | Cerebellar Abiotrophy | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *Kromfohrländer* | Digital Hyperkeratosis (Corny Feet) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| *Kuvasz* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Labrador Retriever* | Centronuclear Myopathy (CNM or HMLR) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 3-5 days |
| | Cystinuria | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| | Exercise induced collapse (EIC) | Autosomal recessive | DNM1 gene | Laboklin | 3-5 days |
| | | | DNM1 gene | Van Haeringen | <20 days € 59,50 |
| | Hereditary Nasal Parakeratosis (HNPK) | Autosomal recessive | | Van Haeringen | <20 days € 91,50 |
| | | | | Laboklin | 3-5 days |
| | | | SUV39H2 gene | Optigen | $120 |
| | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| | Myotubular myopathy (MTM) | X-Chromosomal | | Van Haeringen | <10 days € 39,50 |
| | Narcolepsy | Autosomal recessive | | Van Haeringen | <20 days € 49,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | Hcrtr2 Gene | Optigen | $130 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | Pyruvate kinase Deficiency (PKDef) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |

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| | Retinal Dysplasia Retinal Folds+OculoSkeletal Dysplasia (RD+OSD) 1 | Autosomal dominant (incomplete penetrance) | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 4-6 weeks |
| | | | | Optigen | $160 |
| | Skeletal Dysplasia 2 (SD2) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | Achromatopsia Type 1/Day Blindness | Autosomal recessive | | Optigen | $100 |
| *Lagotto Romagnolo* | Juvenile epilepsy | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 3-5 workdays |
| | | | LGI2 gene | Optigen | $95 |
| *Lakeland Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Lancashire Heeler* | Collie Eye Anomalie (CEA) | Autosomal recessive | | Laboklin | 4-6 weeks |
| | | | | Van Haeringen | <25 days € 140,00 |
| | | | chromosome number 37 | Optigen | $180 |
| | Primary Lens Luxation (PLL) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 3-5 days |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Landseer* | Cystinuria | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | Thrombopathia 3 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| *Lapponian Herder* | Glycogen storage disease type II (Pompe Disease) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | CMR (Canine Multi-focal Retinopathy) | Autosomal recessive | VMD2 Gene | Optigen | US$95.00 |
| *Large munsterlander* | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| *Leonberger* | Leonberger Polyneuropathy 1 (LPN1) | Autosomal recessive | | Laboklin | 1-2 weeks |
| *Lhasa Apso* | Hemophilia B (Facort IX deficiency) | X-linked recessive | | VetGen | $65.00 USD |

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| *Llewellin Setter* | rcd4 Progressive Retinal Atrophy (rcd4 PRA) | Autosomal recessive | C2orf71 Gene | Optigen | $95 |
| *Longhaired Whippet* | Ivermectin hypersensitivity (MDR1 gene defect) | Autosomal recessive | mdr1 gene | Laboklin | 1-2 weeks |
| | Collie Eye Anomaly (CEA) | Autosomal recessive | chromosome number 37 | Optigen | $180 |
| *Lucas Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Maltese* | Glycogen Storage Disease Type I (GSD I) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *Maltipoo* | prcd Progressice Retinal Atrophy (prcd PRA) | Autosomal recessive | prcd Gene | Optigen | $195 |
| *Manchester Terrier* | Von-Willebrands Disease Type 1 | Autosomal dominant (variable penetrance) | | Van Haeringen | <10 days € 89,00 |
| | | | | VetGen | Within 2 weeks $65.00 USD |
| | | | | Laboklin | 3-5 days |
| *Markiesje* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Mastiffs* | CMR1 (Canine Multifocal Retinopathy) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | VMD2 Gene | Optigen | US$95.00 |
| | Dominant Progressive Retinal Atrophy (PRA) | Autosomal dominant | | Van Haeringen | <10 days € 39,50 |
| | | | | Optigen | About 2 weeks $120 |
| | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *McNab* | Ivermectin hypersensitivity (MDR1 gene defect) | Autosomal recessive | mdr1 gene | Laboklin | 1-2 weeks |
| *Miniature American Shepherd* | CMR1 (Canine Multifocal Retinopathy) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | VMD2 Gene | Optigen | US$95.00 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | Cone Degeneration (CD) | Autosomal recessive | CNGB3 Gene | Optigen | $160 |
| | Collie Eye Anomaly (CEA) | Autosomal recessive | chromosome number 37 | Optigen | $180 |
| *Miniature Australian Shepherd* | Canine Multi-focal Retinopathy (CMR) | Autosomal recessive | VMD2 Gene | Optigen | US$95.00 |
| | Cone Degeneration (CD) | Autosomal recessive | CNGB3 Gene | Optigen | $160 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | prcd Gene | Optigen | $195 |

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| | Collie Eye Anomaly (CEA) | Autosomal recessive | chromosome number 37 | Optigen | $180 |
| | Hereditary Cateract (HD) | Autosomal co-dominant | HSF4-2 Gene | Optigen | $100 |
| *Miniature Bull Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Miniature Pinscher* | Cystinuria | Autosomal dominant | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| *Miniature Poodle* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | Macrothrombocytopenia (MTC) | autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *Miniature Schnauzer* | Myotonia Congenita | Autosomal recessive | | Van Haeringen | <20 days € 49,50 |
| | | | | Laboklin | 3-5 days |
| | Type A Progressive Retinal Atrophy (Type A PRA) | Autosomal recessive | | Van Haeringen | <25 days € 132,50 |
| | | | | Optigen | $160 |
| | Persistent Muellerian Duct Syndrome (PMDS) | Sex-limited autosomal recessive trait | MISRII Gene | Optigen | $95 |
| *Moyen Poodle* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| *Newfoundland* | Cystinuria | Autosomal recessive | | Laboklin | 3-5 days |
| | | | Gene SLC3A1 | Van Haeringen | <10 days € 39,50 |
| | | | | VetGen | $65.00 USD |
| | | | | Optigen | $80 |
| *Norfolk Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| *Norwegian Elkhound* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Norwich Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Nova Scotia Duck Tolling Retriever* | Collie Eye Anomalie (CEA) | Autosomal recessive | | Laboklin | 4-6 weeks |
| | | | | Van Haeringen | <25 days € 140,00 |

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| | | | chromosome number 37 | Optigen | $180 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Old Danish Pointer* | Congenital Myasthenic Syndrome | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *Old English Sheepdog (Bobtail)* | Cerebellar Ataxia 2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Exercise induced collapse (EIC) | Autosomal recessive | DNM1 gene | Laboklin | 3-5 days |
| | Ivermectin hypersensitivity (MDR1 gene defect) | Autosomal recessive | mdr1 gene | Laboklin | 1-2 weeks |
| | Primary ciliary Dyskinesia (PCD) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| | Collie Eye Anomalie (CEA) | Autosomal recessive | | Van Haeringen | <25 days € 140,00 |
| *Otterhound* | Thrombasthenia | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *Papillion* | Pap-Progressive Retinal Atrophy 1 (Pap-PRA1) | Autosomal recessive | | Van Haeringen | <25 days € 100,00 |
| | | | | Laboklin | 1-2 weeks |
| | | | | Optigen | $90 |
| | Cone-Rod Dystrophy 1-PRA (Cord1-PRA) | Autosomal recessive | | VetGen | $65.00 USD |
| | Von-Willebrands Disease Type 1 | Autosomal dominant (variable penetrance) | | Van Haeringen | <10 days € 89,00 |
| | | | | VetGen | Within 2 weeks $65.00 USD |
| | | | | Laboklin | 3-5 days |
| *Parson Russell Terrier* | Late onset ataxia (LOA) | Autosomal recessive | CAPN1 -gene | Laboklin | 1-2 weeks |
| | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| | Macrothrombocytopenia (MTC) | autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| | Spinocerebellar ataxia (SCA) | Autosomal recessive | | Laboklin | 3-5 days |
| *Patterdale Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |

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| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Pembroke Welsh Corgi* | Exercise induced collapse (EIC) | Autosomal recessive | DNM1 gene | Laboklin | 3-5 days |
| | Von-Willebrands Disease Type 1 | Autosomal dominant (variable penetrance) | | Van Haeringen | <10 days € 89,00 |
| | | | | VetGen | Within 2 weeks $65.00 USD |
| | | | | Laboklin | 3-5 days |
| *Perro de Presa Canarios* | CMR1 (Canine Multifocal Retinopathy) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | VMD2 Gene | Optigen | US$95.00 |
| *Phalene* | Pap-Progressive Retinal Atrophy 1 (Pap-PRA1) | Autosomal recessive | | Van Haeringen | <25 days € 100,00 |
| | | | | Laboklin | 1-2 weeks |
| | | | | Optigen | $90 |
| *Pitbull Terrier* | Cone Rod Dystrophy 2 (CRD2) | Autosomal recessive | | Van Haeringen | <25 days € 100,00 |
| | Hyperuricosuria (HU) | Autosomal recessive | | VetGen | $65.00 USD |
| *Polish Lowland Sheepdog* | rcd4 Progressive Retinal Atrophy (rcd4 PRA) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | C2orf71 Gene | Optigen | $95 |
| *Pomeranian* | Vitamin D-deficiency rickets, type II | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *Poodle* | Neonatal Encephalopathy | Autosomal recessive | ATF2 Gene | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| | Von-Willebrands Disease Type 1 | Autosomal dominant (variable penetrance) | | Van Haeringen | <10 days € 89,00 |
| | | | | VetGen | Within 2 weeks $65.00 USD |
| | | | | Laboklin | 3-5 days |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | prcd Gene | Optigen | $195 |
| *Portuguese Water Dog* | GM1-Gangliosidosis | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Optigen | $120 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |

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| *Pug* | Necrotizing Meningoencephalitis (NME) | Autosomal recessive (variable penetrance) | | Laboklin | 1-2 weeks |
| | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | Pyruvate kinase Deficiency 2 (PKDef) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| *Rat Terrier* | Congenital Hypothyroidism (CHG) 3 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Rhodesian Ridgeback* | Haemophilia B (factor IX deficiency) | X-chromosomal-recessive | | Laboklin | 3-5 days |
| | | | | VetGen | $65.00 USD |
| *Rough Collie* | rcd2 Progressive Retinal Atrophy (rcd2 PRA) | Autosomal recessive | | Van Haeringen | <25 days € 187,50 |
| | | | | Optigen | $180 |
| | Collie Eye Anomaly (CEA) | Autosomal recessive | chromosome number 37 | Optigen | $180 |
| *Saarloos Wolfdog* | Pituitary dwarfism | Autosomal recessive | | Van Haeringen | <20 days € 69,50 |
| | | | | Laboklin | 1-2 weeks |
| *Samoyed* | Familial Nephropathy (FN) | X-chromosomal-recessive | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| | Retinal Dysplasia Retinal Folds+OculoSkeletal Dysplasia (RD+OSD) 2 | Autosomal recessive | | Van Haeringen | <25 days € 132,50 |
| | | Autosomal-dominant with incomplete penetrance | | Laboklin | 4-6 weeks |
| | | Autosomal dominant with incomplete penetrance | | Optigen | $160 |
| | X Linked Progressive Retinal Atrophy 1 (XL PRA1) | X-Chromosomal | | Van Haeringen | <10 days € 39,50 |
| | | | | Optigen | $150 |
| *Schapendoes* | gPRA (Progressive Retinal Atrophy) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| *Schipperke* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |

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| *Scottish Deerhound* | Faktor VII - Deficiency | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | VetGen | $65.00 USD |
| *Scottish Terrier* | Von-Willebrands Disease Type 3 | Autosomal recessive | | Van Haeringen | <10 days € 49,50 |
| | | | | VetGen | $65.00 USD |
| | | | | Laboklin | 1-2 weeks |
| *Sealyham Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Shetland Sheepdog* | Collie Eye Anomalie (CEA) | Autosomal recessive | | Laboklin | 4-6 weeks |
| | | | | Van Haeringen | <25 days € 140,00 |
| | | | chromosome number 37 | Optigen | $180 |
| | Ivermectin hypersensitivity (MDR1 gene defect) | Autosomal recessive | mdr1 gene | Laboklin | 1-2 weeks |
| | Von-Willebrands Disease Type 3 | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| *Shiba Inu* | GM1 Gangliosidosis | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *Shih Tzu* | Prekallikrein deficiency | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Macrothrombocytopenia (MTC) | Autosomal dominant | beta-1 tubulin gene | VetGen | $65.00 USD |
| *Siberian Husky* | X Linked Progressive Retinal Atrophy 1 (XL PRA1) | X-Chromosomal | | Van Haeringen | <10 days € 39,50 |
| | | | | Optigen | $150 |
| *Silken Windhound* | Ivermectin hypersensitivity (MDR1 gene defect) | Autosomal recessive | mdr1 gene | Laboklin | 1-2 weeks |
| | Collie Eye Anomaly (CEA) | Autosomal recessive | chromosome number 37 | Optigen | $180 |
| *Silky Terrier* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | prcd Gene | Optigen | $195 |
| *Sloughi* | rcd1a Progressive Retinal Atrophy (rcd1a PRA) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | PDE6B gene | Optigen | $80 |
| *Small Munsterlander* | rcd4 Progressive Retinal Atrophy (rcd4 PRA) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | C2orf71 Gene | Optigen | $95 |

| | | | | | |
|---|---|---|---|---|---|
| *Smooth Collies* | rcd2 Progressive Retinal Atrophy (rcd2 PRA) | Autosomal recessive | | Van Haeringen | <25 days € 187,50 |
| | | | | Optigen | $180 |
| | Collie Eye Anomaly (CEA) | Autosomal recessive | chromosome number 37 | Optigen | $180 |
| *Soft-Coated Wheaten Terrier* | Protein losing nephropathy (PLN) | Autosomal recessive | | Laboklin | 3-5 days |
| *Spaniel breeds* | Phosphofructokinase deficiency (PFK) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *Spanish Water Dog* | Congenital Hypothyreosis (CHG) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | Van Haeringen | <10 days € 39,50 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Stabijhoun* | Von-Willebrands Disease Type 1 | Autosomal dominant (variable penetrance) | | Van Haeringen | <10 days € 89,00 |
| | | | | VetGen | Within 2 weeks $65.00 USD |
| | | | | Laboklin | 3-5 days |
| *Staffordshire Bull Terrier* | Hereditary Cataract 2 (HSF4) | Autosomal recessive | HSF4 Gene | Van Haeringen | <10 days € 39,50 |
| | | | HSF4 Gene | VetGen | $65.00 USD |
| | | | HSF4 gene | Laboklin | 1-2 weeks |
| | | | HSF4-1 Gene | Optigen | $100 |
| | L2-Hydroxyglutaric aciduria (L2-HGA) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 3-5 days |
| *Sussex Spaniel* | Pyruvate Dehydrogenase Phosphatase 1 (PDP1) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| *Swedish Lapphund* | Glycogen storage disease type II (Pompe Disease) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Teddy Roosevelt Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Tenterfield Terrier* | Congenital Hypothyroidism (CHG) 2 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |

| | | | | | |
|---|---|---|---|---|---|
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Tibetan Terrier* | Neuronal ceroid lipofuscinosis (NCL) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | Primary Lens Luxation (PLL) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 3-5 days |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| | rcd4 Progressive Retinal Atrophy (rcd4 PRA) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | C2orf71 Gene | Optigen | $95 |
| *Toy Fox Terrier* | Congenital Hypothyroidism (CHG) 3 | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Toy Poodle* | Gangliosidosis, GM2, type II | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| *Volpino Italiano* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Wäller* | Hereditary cataract (HC) | Autosomal dominant | HSF4 gene | Laboklin | 1-2 weeks |
| *Weimaraner* | Hypomyelination (Shaking Puppy Syndrome) | Autosomal recessive | | Laboklin | 1-2 weeks |
| *Welsh Corgi* | Muscular Dystrophy, Duchenne type (MDM) | X-Chromosomal | | Van Haeringen | <10 days € 39,50 |
| | rcd3 Progressive Retinal Atrophy (rcd3 PRA) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | X-linked severe combined Immunodeficiency (X-SCID) | X-Chromosomal | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| *Welsh Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |

| | | | | | |
|---|---|---|---|---|---|
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Westhighland White Terrier* | Globoid Cell Leukodystrophy / Krabbes Disease | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | | | Laboklin | 1-2 weeks |
| | Pyruvate kinase deficiency (PK) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| *Westphalia Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| *Whippet* | Collie Eye Anomalie (CEA) | Autosomal recessive | | Laboklin | 4-6 weeks |
| | | | | Optigen | $180 |
| | Muscular Hypertrophy | Autosomal dominant | | Van Haeringen | <10 days € 39,50 |
| | | Autosomal recessive | | Laboklin | 1-2 weeks |
| | Phosphofructokinase deficiency (PFKD) | Autosomal recessive | | Laboklin | 1-2 weeks |
| | | | | VetGen | $65.00 USD |
| *White Shepherd* | Ivermectin hypersensitivity (MDR1 gene defect) | Autosomal recessive | mdr1 gene | Laboklin | 1-2 weeks |
| *Whire-haired Fox Terrier* | Primary lens luxation (PLL) | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| *Wire-haired Pointer* | Exercise induced collapse (EIC) | Autosomal recessive | DNM1 gene | Laboklin | 3-5 days |
| *Wolfdog* | Dilated Cardiomyopathy | Autosomal recessive | | Van Haeringen | <10 days € 39,50 |
| *Yorkshire Terrier* | prcd Progressive Retinal Atrophy (prcd PRA) | Autosomal recessive | | Van Haeringen | <25 days € 150,00 |
| | | | prcd Gene | Optigen | $195 |
| | Primary lens luxation (PLL) | Autosomal recessive | | Laboklin | 3-5 days |
| | | | | Van Haeringen | <10 days € 39,50 |
| | | Carriers have a small chance of getting sick. | | VetGen | $65.00 USD |
| | | 2-20% of carriers will develop condition | | Optigen | $90 |
| | L2-Hydroxyglutaric Aciduria | Autosomal recessive | | VetGen | $65.00 USD |

## Appendix 2

Dear Sir/Madam,

We are two Veterinary Medicine students at the University of Utrecht. We are doing a research internship with the subject 'DNA tests for inherited diseases; which ones are applicable for the market in the Netherlands?' under supervision of prof. dr. Jan Rothuizen and dr. Peter Leegwater. The goal is to produce a list of DNA tests which are, in our opinion, scientifically valid and suited for purebred dog populations in the Netherlands. Dog breeders and veterinarians can use this list to choose a reliable test for specific breeds and diseases. Advice of veterinarians will be used by dog breeders and the Kennel club to define a breeding program to systematically improve the health status of these populations and test the health of the actual offspring.

During our search on the internet we identified your company as one of the largest suppliers of DNA tests for inherited diseases in the Netherlands. Your support to our study will therefore be of great importance. To be able to evaluate the tests you offer we have the following questions relating to essential information we will need to evaluate the tests which is not available on your website.

We saw on your website many tests for different diseases. The questions we want to ask you are:

- What type of test is used for each disease, a mutation test or a marker test?
- Is the each test based on published peer reviewed information? If so, can you please indicate the reference to the key publications on which your test is based?
- If the test is offered for more than one breed than those mentioned in the key publications, can you inform us about additional information you may have about the applicability in other breeds?

We would be most grateful to receive your answers to our questions. If you require any further information, feel free to contact us.

Yours sincerely,

Amy Koning (A.J.Koning@uu.nl)
Maaike Fennema (M.Fennema@uu.nl)
Prof. dr. Jan Rothuizen (J.Rothuizen@uu.nl)
Mr. Peter Leegwater (P.A.J.Leegwater@uu.nl)

# Appendix 3

## Laboratory: VETGEN

Dear Amy and Maaike,

Our web site is a constant work in progress, but as for the current listings we can tell you that some have been developed in house while most are based on research done elsewhere. All of the primary publications for each test may be found on the WSAVA database hosted by UPenn.

http://research.vet.upenn.edu/Default.aspx?TabId=7620

Here you can search by disease or breed, and primary publications where available will be listed. In the cases where we have breeds not listed in the primary publication, it is due either to reference in secondary publications as with many of the eye diseases, or detection of the mutation in our own research samples. In the case of all of the typeI vWD breeds, the additional breeds were added after correlation between the presence of the mutation and known bleeders with low ELISA numbers for most breeds.
Let us know if you have questions about any specific tests.
VetGen Customer Service
vetgen@vetgen.com

## Laboratory: OPTIGEN

Dear Maaike,

Thank you for contacting OptiGen about your internship project and for taking on this worthwhile project. I have provided brief replies to your questions below in red text. If further details are needed, please feel free to contact me.

Best regards,

Sue PK

Sue Pearce-Kelling
President and Manager, OptiGen, LLC

We saw on your website many tests for different diseases. The questions we want to ask you are:
- What type of test is used for each disease, a mutation test or a marker test?

*Currently (as of 5/11/15), ALL of OptiGen's DNA tests are mutation, not marker, based.*

- Is each test based on published peer reviewed information? If so, can you please indicate the reference to the key publications on which your test is based?

*Most of OptiGen's tests are based on published peer-reviewed information and all in that category are referenced in the WSAVA database: http://research.vet.upenn.edu/Default.aspx?TabId=7620 If you are not familiar with this useful site, I think you may find it very informative. Unfortunately, there is currently one important piece of information missing from this database—the mention of Intellectual Property (patents & licensing). As you may be aware, some of the DNA tests are governed by patents and licenses are required in order for a laboratory to use/sell the tests. You can find information on OptiGen's licensed tests on our webpage here: http://www.optigen.com/opt9_patent.html*

- If the test is offered for more than one breed than those mentioned in the keypublications, can you inform us about additional information you may have about the applicability in other breeds?

*All of the tests that Optigen currently offers are mutation based and to the best of our knowledge, are typically fully penetrant, regardless of breed background. The prcd-PRA mutation, for example, has been shown to cause PRA in many more breeds than were initially known to carry the mutation at the time of the research paper publication (in 2005). We are aware that there can be some variations in age of onset and rate of disease progression, particularly in a couple of breeds that carry prcd. English Cocker Spaniels (ECS) that are homozygous for the prcd mutation often do not show clinical symptoms of PRA until they are over 7 years of age whereas most breeds that are homozygous for prcd show clinical symptoms of early-stage retinal degeneration by the time dogs are 3-4 years of age. We are very interested in understanding what modifiers in the ECS genetic background cause this delayed/slower retinal disease progression.*

**Laboratory: LABOKLIN**

Beste Maaike,

Ik ga eens kijken wat ik voor jullie kan doen. Het is zo dat wij alleen testen aanbieden als wij ergens een bewijzend onderzoek hebben gevonden.
Maar bel mij maar even wanneer jullie tijd hebben.

Met vriendelijke groet,

Alexandra Knossenburg

## Appendix 4

# Neurological diseases

**Bandera's Neonatal Ataxia (BNAt)**

| | |
|---|---|
| Good Coton de Tulear | Penngen article (6) |

**Cerebellar Ataxia / Neuronal ceroid lipofuscinosis (NCL), 4A**

| | |
|---|---|
| Good American Staffordshire Terrier | Penngen article(7) |
| Wrong American Pitbull Terrier | Same article as American Staffordshire Terrier, this article is only about AST breeds and not about American Pitbull Terriers. Also, there is nothing to find about this particular disease or gene in this breed. |

**Canine Degenerative Myelopathy (DM)**

| | |
|---|---|
| Good All breeds | Penngen article(8)<br>Own article(9) (addition to the article on Penngen) |

**Canine Multiple System Degeneration (CMSD)**

| | |
|---|---|
| Good Chinese Crested and Kerry Blue Terrier | Own article(10) (disease not on Penngen) |

**Centronuclear Myopathy (CNM or HMLR)**

| | |
|---|---|
| Good Labrador | Penngen article(11) |

**Centronuclear Myopathy (CNM)**

| | |
|---|---|
| Good Great Dane | Penngen article(12) |

**Cerebellar Abiotrophy**

| | |
|---|---|
| Wrong Australian Kelpie | Own article(13) (disease not on Penngen)<br>the gene causing this disease is not mentioned in this article and cannot be found for this breed. |

**Cerebellar Ataxia 2**

| | |
|---|---|
| Good Gordon Setter | Penngen article(14) |
| Good Old English Sheepdog | |

**Cerebellar Ataxia, progressive early-onset**

| | |
|---|---|
| Good Finnish Hound | Penngen article(15) |

**Globoid cell Leukodystrophy (Krabbe disease)**

| | |
|---|---|
| Good Cairn Terrier | Penngen article(16) |
| Good Westhighland White Terrier | |
| Good Irish Setter | Penngen article(17) |

**GM1 Gangliosidosis**

| | |
|---|---|
| Good Shiba Inu | Own article(18) (link on Penngen refers to a wrong website) |
| Good Portugese Water Dog | Own article(19) (link on Penngen refers to a wrong website) |
| Good Husky | Own article(20) (disease not on Penngen) |

**GM2 Gangliosidosis**

| | |
|---|---|
| Good Toy Poodle | Penngen article(21) |

**Hereditary polyneuropathy (HN)**

| | |
|---|---|
| Good Greyhound | Penngen article(22) |

**Hypomyelination (Shaking Puppy Syndrome)**

| | |
|---|---|
| Good Weimaraner | Penngen article(23) |

**Juvenile Epilepsy**

| | |
|---|---|
| Good Lagotto Romagnolo | Penngen article(24) |

**L2-Hydroxyglutaric Aciduria**

| | |
|---|---|
| Good Staffordshire Bull Terrier | Penngen article(25) |
| Good Yorkshire Terrier | Penngen article(26) |

**Late onset ataxia (LOA)**

| | |
|---|---|
| Good Parson Russell Terrier | Own article(27) (disease not on Penngen) |
| Good Jack Russel Terrier | |

**Leonberger Polyneuropathy 1 (LPN1)**

| | |
|---|---|
| Good Leonberger | Own article(28) (article on Penngen is not a research article) |

**Narcolepsy**

| | |
|---|---|
| Good Dobermann Pinscher | Penngen article(29) |
| Good Labrador Retriever | |
| Good Dachshund | Penngen article(30) |

**Necrotizing Meningoencephalitis (NME)**

| | |
|---|---|
| Wrong Pug | Penngen article(31) (Markertest) Because it is a marker test it is not recommendable to use this test for identifying this disease. |

**Neonatal cortical cerebellar abiotrophy (NCCD)**

| | |
|---|---|
| Good Beagle | Penngen article(32) |

**Neonatal Encephalopathy**

Good Poodle — Penngen article(33)

**Neuroaxonal dystrophy (NAD)**

Wrong Giant Schnauzer — Penngen article(34) In the article, the Giant Schnauzer breed is not mentioned. Also, there is nothing to find about this disease in this breed.

**Neuronal Ceroid Lipofuscinosis (NCL)**

Good Tibetan Terrier — Penngen article(35)

**Neuronal ceroid lipofuscinosis (NCL) 1 / 2**

Good Dachshund — Penngen article(36)

**Neuronal ceroid lipofuscinosis (NCL) 10**

Good American Bulldog — Penngen article(37)

**Neuronal ceroid lipofuscinosis (NCL) 5**

Good Border Collie — Penngen article(38)

**Neuronal ceroid lipofuscinosis (NCL) 8**

Good English Setter — Penngen article(39)

Wrong Irish Setter. — Same reference on Penngen as the English Setter, but the Irish Setter is a different breed. Also, there is nothing to find about this disease in this breed.

**Polyneuropathy 1**

Good Alaskan Malamute — Penngen article(40)

# Skeletal and muscle diseases

**Brittle bone disease / Osteogenesis imperfecta**

Good Dachshund — Penngen article(41)

Wrong Beagle. — This is a very serious condition where the dogs who are affected will not live a very long time plus the dog can be diagnosed immediately after birth. Because it inherits in a dominant manner it has no added value to test the dogs.

**Congenital Myasthenic Syndrome**

Good Old Danish Pointer — Penngen article(42)

**Episodic Falling (EF)**

| | |
|---|---|
| Good Cavalier King Charles Spaniel | Penngen article(43) |

**Exercise induced collapse (EIC)**

| | |
|---|---|
| Good Labrador Retriever | Penngen article(44) |
| Good Chesapeake Bay Retriever | |
| Good Curly-coated Retriever | |
| Good Boykin Spaniel | Own article(45) (these breeds are not mentioned in the article on Penngen) |
| Good Pembroke Welsh Corgi | |
| Wrong Wire-haired Pointer | Nothing to find about this disease in these breeds. |
| Wrong Old English Sheepdog | |

**Hip laxity/dysplasia**

| | |
|---|---|
| Wrong Different breeds | It has a multifactoral origin which makes it until today almost impossible to predict with a 100% accuracy whether or not a dog will develop hip dysplasia. |

**Maligant hyperthermia (MH)**

| | |
|---|---|
| Good All breeds | Own article(46) (disease not on Penngen) |

**Muscular Dystrophy (GRMD)**

| | |
|---|---|
| Good Golden Retriever | Own article(47) (better article than the one on Penngen) |

**Muscular dystrophy (MD)**

| | |
|---|---|
| Good Cavalier King Charles Spaniel | Penngen article(48) |

**Muscular Dystrophy, Duchenne type (MDM)**

| | |
|---|---|
| Good Corgi Breeds | Own articlel(49) (disease not on Penngen) |

**Muscular Hypertrophy**

| | |
|---|---|
| Good Whippet | Penngen article(50)<br>According to laboratory Van Haeringen the mutation is dominant, but according to the article the mutation is recessive. |

**Myotonia Congenita**

| | |
|---|---|
| Good Miniature Schnauzer | Own article(51) (link from Penngen does not have a full text) |

**Myotonia Congenita 2**

| | |
|---|---|
| Good Australian Cattle Dog | Penngen article(52) (not a full text) |

**Myotubular myopathy (MTM)**

Good Labrador Retriever — Penngen article(53)

**Pituitary dwarfism**

Good Czechoslovakian Wolfdog — Own article(54) (reference on Penngen was wrong)

Good Saarloos Wolfdog

Good German Shepherd — Penngen article(55)

**Skeletal Dysplasia 2 (SD2)**

Good Labrador Retriever — Penngen article(56)

**Tremor, X-linked**

Good English Springer Spaniel — Penngen article(57)

# Skin diseases

**Digital Hyperkeratosis (Corny Feet)**

Good Kromhofrlander — Penngen article(58)

Good Irish Terrier

**Ectodermal dysplasia/Skin fragility syndrome (ED/SFS)**

Good Chesepeake Bay Retriever — Penngen article(59)

**Epidermolysis bullosa, dystrophic (RDEB)**

Good Golden Retriever — Penngen article(60)

**Hereditary Nasal Parakeratosis (HNPK)**

Good Labrador Retriever — Penngen article(61)

**Ichthyosis 2**

Good Golden Retriever — Penngen article(62)

**Junctional epidermolysis bullosa (JEB)**

Good German Shorthaired Pointer — Own article(63) (disease not on Penngen)

**Musladin-Lueke syndrome (MLS)**

Good Beagle — Penngen article(64)

# Kidney diseases

**Cystinuria**

Good Labrador — Penngen article(65)

Good Australian Cattle Dog

| | |
|---|---|
| Good Miniature Pinscher | |
| Good Newfoundland | Penngen article(66) |
| Wrong Landseer | Penngen link does not work. Also, nothing to find about this disease in this breed. |

**Familial Nephropathy (FN)**

| | |
|---|---|
| Good English Cocker Spaniel | Own article(67) (Penngen refers to wrong disease) |
| Good English Springer Spaniel | Penngen article(68) |
| Good Samoyed | Penngen article(69) |
| Wrong American Cocker Spaniel. | Link on Penngen refers to the wrong disease. Also, nothing to find about this disease in this breed. |

**Hyperuricemia (HUU)/Hyperurocosuria (HU)**

| | |
|---|---|
| Good American Staffordshire Terrier | Penngen article(70) |
| Good Australian Shepherd | |
| Good Black Russian Terrier | |
| Good Boerboel | |
| Good Bull Dog | |
| Good German Shepherd | |
| Good Giant Schnauzer | |
| Good Large Munsterlander | |
| Good Parson Russell Terrier | |
| Wrong American Pitbull Terrier (Vetgen) | Nothing to find about this disease in this breed. |
| Wrong Dalmation | Purebred Dalmations do not need to be tested for this disease, they are always homozygote for the mutation. |
| Wrong All breeds (Van Haeringen) | Article on Penngen refers to specific breeds. |

**Polycystic Kidney Disease (PKD1)**

| | |
|---|---|
| Good Bull Terrier | Penngen article(71) |

**Protein losing Nephropathy (PLN)**

| | |
|---|---|
| Good Soft Coated Wheaten Terrier | Own article(72) (link on Penngen does not work) |

**Renal Cystadenocarcinoma and Nodular Dermatofibrosis**

| | |
|---|---|
| Good German Shepherd | Own article(73) (link on Penngen does not work) |

# Sex and respiratory diseases

**Persistent Muellerian Duct Syndrome (PMDS)**

| | |
|---|---|
| Good Miniature Schnauzer | Penngen article(74) |

**Primary Ciliary Dyskinesia (PCD)**

| | |
|---|---|
| Good Old English Sheepdog (Bobtail) | Own article(75) (reference on Penngen is good, but Refworks gives an error) |