Hip Dysplasia in Labrador Retrievers

New DNA test available to assess the genetic predisposition of Labrador Retrievers to develop Hip Dysplasia

Introduction

Canine hip dysplasia (CHD) is a common inherited orthopedic trait. This joint malformation (dysplasia) results in instability and subluxation of the hip which ultimately causes erosion of the articular cartilage and synovitis. Secondary osteoarthritis precipitates the clinical signs of lameness. The disease affects dogs of all breeds with different prevalence. Breed occurrence, as estimated by the Orthopedic Foundation for Animals (OFA), varies widely from 1 % to 75 %.

For many years, veterinarians have relied on a phenotypic assessment of the hips of dogs based on radiography. The Orthopedic Foundation for Animals, Federation Cynologique Internationale (FCI), British Veterinary Association/Kennel Club (BVA/KC), Pennsylvania Hip Improvement Program (PennHIP) and Dorsolateral Subluxation Score (DLS) are the 5 most widespread and thoroughly investigated screening approaches for canine hip dysplasia.

The primary goal for each screening program is to exclude genetically burdened individuals from the breeding pool.

Because CHD is a polygenetic heritable trait and current screening systems rely on interpretation of radiographs, their efficacy reducing CHD is limited. This method of diagnosis can be combined with a clinical examination to make treatment decisions, but it is not a reliable method for eliminating affected dogs from a breed or for selecting dogs with the most resistant genetic composition for breeding, because hip dysplasia is a complex or quantitative trait. Despite intensive screening for 4 decades, the prevalence of CHD is still as high as 40 % in some breeds. In addition to that, there is controversy regarding the perfect age for the testing, the X-ray technique involves general anesthesia and the performing vet needs to have a special X-ray training and certificate.

Therefore the development of a genetic test was the main goal for years, especially as even a phenotypically normal dog can carry mutations that influence trait expression in the next generation.

The idea was to find the genes that contribute to hip dysplasia and to use molecular markers near these contributing genes or the genetic mutations themselves to identify susceptible or resistant dogs. These breeding values and genetic marker information can be used to assess the potential orthopedic health of the animal. The information can then be used in conjunction with radiographic hip screening on a pedigree to derive breeding values that could be applied in breeding programs or registries to reduce the incidence of the trait.
Dysgen® DNA test

Dysgen® is a test which predicts the genetic predisposition to hip dysplasia in Labrador Retrievers at early age. The test has an accuracy of 85 %, mean diagnostic sensitivity of 80 % and specificity of 78 %.

One of its main advantages is that it is independent from age.

While classical X-ray (PennHIP method) based diagnostics for joint laxity and osteoarthritis are recommended to be carried out not earlier than 4 months of age and VD hip X-rays even at a later age, the genetic test has high value for breeders wanting to make breeding decisions, for pet owners as a purchase exam, and also for veterinarians working up hip dysplasia in their patients. The result of the test can help determine the frequency of the rechecks, which test would be suitable and if treatment might become necessary. Early detection is fundamental for better clinical management and follow-up.

The test assesses the presence or absence of 7 single nucleotide polymorphisms (SNPs), which have been found to be linked to hip dysplasia in this dog breed.

Currently, the test is only available for Labrador Retrievers, but the 7 SNPs are believed to have use in other dog breeds including Golden Retrievers and German Shepherds as well, which are currently under clinical investigation. The test was developed by researchers at Bioiberica, the University of Barcelona and Progenica Inc.

Dysgen® is not a test to diagnose hip dysplasia. Diagnostic workflow to assess the existence of hip dysplasia still follows the scoring mode of the three CHD organizations FCI (Federation Cynologique Internationale), OFA (Orthopedic Foundation for Animals) and the BVA/KC (British Veterinary Association/ The Kennel Club).

Test report

The Dysgen® test analyzes the genetic profile of the animal and offers several possible results according to the genetic susceptibility of developing hip dysplasia. The recommended clinical and follow-up actions depend on the test result and should be interpreted together with the clinical evaluation of each animal.

Test results and genetic susceptibility to develop hip dysplasia:

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<tr>
<th>MINIMAL</th>
<th>LOW</th>
<th>MODERATE</th>
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<td>3 %</td>
<td>16 %</td>
<td>45 %</td>
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Fig. 1 Genetic susceptibility to hip dysplasia given by the test

MINIMAL:

The genetic predisposition of this dog to develop hip dysplasia is below the average (20 %) of the general population of Labrador Retrievers. 3 % of dogs in this risk group develop hip dysplasia, representing a 6.7 times lower risk than the average Labrador Retriever.

1. Minimum Predisposition
   (3 % chance of developing hip dysplasia):
   General preventive measures:
   Despite the minimum risk of developing hip dysplasia, preventing the animal from becoming overweight and promoting moderate exercise is recommended.
   Follow up:
   Clinical examination and x-ray study at 8 months of age. In dogs with special genetic value (high racial value, breeders) the owner is encouraged to perform an x-ray and clinical examination at 24 months (OFA).
   Follow up:
   Encourage the owner/breeder to breed his animal preferably with dogs with a minimum or low predisposition according to the Dysgen® genetic test.
LOW:

The genetic predisposition of this dog to develop hip dysplasia is similar to the average (20%) of the general population of Labrador Retrievers. 16% of dogs in this risk group develop hip dysplasia.

2. Low Predisposition (16% chance of developing hip dysplasia):

   General preventive measures:
   Despite the low risk of developing hip dysplasia, preventing the animal from becoming overweight and encouraging moderate exercise especially as concerns the posterior third are recommended. Avoid high intensive exercise especially before 9 – 10 month of age. Also, an appropriate type of food should be chosen for this type of growing animal.

   Follow up:
   Clinical examination and x-ray study at 6 months of age. In dogs with special genetic value (high racial value, breeders) the owner is encouraged to perform an x-ray and clinical examination at 24 months (OFA).

   Reproduction:
   If the owner/breeder wishes, advise that this animal should only be bred with dogs with a minimum or low predisposition to hip dysplasia according to the Dysgen® genetic test.

MODERATE:

The genetic predisposition of this dog to develop hip dysplasia is above the average (20%) of the general population of Labrador Retrievers. 45% of dogs in this risk group develop hip dysplasia, representing a 2.3 times higher risk than the average Labrador Retriever.

3. Medium Predisposition
   (45% chance of developing hip dysplasia):

   General preventive measures:
   Due to the medium risk of developing hip dysplasia, it is very important to prevent this animal from becoming overweight. Promote moderate (no intensive) exercise to improve range of motion, maintain cartilage in good condition and increase muscle tone. Ex. Walk with belt (first slowly way up, second trot), squats, cavaletti. Avoid sliding surface. Appropriate type of food should be chosen for this type of growing animal and the administration of products that promote joint health should be considered.

   Follow up:
   Clinical examination and x-ray study at 6 months of age. In animals with a limp/joint pain, joint laxity (positive Ortolani sign) or osteoarthritic changes in the hip, consultation of an orthopedic surgeon might be useful. In asymptomatic dogs, owners are encouraged to perform a second x-ray at 24 months and afterwards an x-ray and clinical examination every 2 – 3 years, to identify possible changes in the hips. In symptomatic dogs concomitant medical therapy is recommended to limit pain and the progression of osteoarthritis.

   Follow up:
   Advise the owner/breeder to avoid the reproduction of this animal.

HIGH:

The genetic predisposition of this dog to develop hip dysplasia is above the average (20%) of the general population of Labrador Retrievers. 67% of dogs in this risk group develop hip dysplasia, representing a 3.4 times higher risk than the average Labrador Retriever.

4. High Predisposition
   (>67% chance of developing HD)
   Same recommendations are applicable as for dogs with Medium predisposition, but adding more restricted indications related exercise.

Dysgen® Hip Dysplasia DNA Test

PCR test for seven genetic markers for predisposition to hip dysplasia in Labrador Retrievers

Sample type: 1 ml EDTA blood
Turn around time: 10 – 15 working days

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Literature Review


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