## HIP DYSPLASIA

Hip dysplasia (HD) is a developmental disorder of the hip (coxo-femoral) joint in which excessive looseness and abnormal shape of the joint structures leads in many cases to debilitating osteoarthritis (OA). The disease is usually seen in both hips, although some difference in severity may be noted between the right and left hip.

HD is a complex disease and it's mode of inheritance is multifactorial, meaning that many genes and many environmental factors contribute to the occurrence and severity of the disease . Control of a multifactorial genetic disease represents a very different challenge to the elimination of a disease arising from a mutation in a single gene: it requires a more complex approach and a greater number of generations to effect a response. Several control schemes which involve determination of phenotypes from radiographic examination of the hips, have been established worldwide for the control of HD. In Australia the method of scoring most extensively used is based on British Veterinary Association/ Kennel Club scheme and known as the Australian National Kennel Council (ANKC) – Canine Hip and Elbow Dysplasia Scheme (CHEDS)

### CHEDS

The ANKC-CHEDS Scheme evaluates nine traits for each hip individually assessed against an ordinal categorical scale from a radiograph taken with the hips in extension. The Categories measured individually for each hip are:



| Hip Joint Radiographic Features   | Score Range | Right  | Left   |
|-----------------------------------|-------------|--------|--------|
| Norberg Angle                     | 0-6         |        |        |
| Subluxation                       | 0-6         |        |        |
| Cranial Acetabular Edge           | 0-6         |        |        |
| Dorsal Acetabular Edge            | 0-6         |        |        |
| Cranial Effective Acetabular Edge | 0-6         |        |        |
| Acetabular Fossa                  | 0-6         |        |        |
| Caudal Acetabular Edge            | 0-5         |        |        |
| Femoral Head/Neck Exostosis       | 0-6         |        |        |
| Remoral Head Recontouring         | 0-6         |        |        |
| TOTALS                            |             |        |        |
|                                   |             | (0-53) | (0-53) |

### SCORING

Each category described above is scored with a number between 0 (normal hip) and 6 (greatest deviation from normal), except one trait (Caudal Acetabular Edge – CaAE) which is scored from 0 to 5 for each hip. Perfects hips would therefore have a score of 0 for each hip which is shown as 0:0, the worst hips would have a score of 53 for each hip displayed as 53:53 giving a hip score of 106. The average hip score for golden retrievers which is determined from x-rays submitted into the CHED scheme is 11 (AVA 2014).

The ANKC –CHEDS Report form can be viewed <u>here</u>

## THE PENNSYLVANIA HIP IMPROVEMENT PROGRAM (PennHip)

Another scheme developing popularity is PennHip. Currently, the University of Pennsylvania manages PennHip as a not-forprofit organization. Unlike the screening method above, the PennHip method mainly focuses on passive hip joint laxity with the objective of detecting passive joint laxity as young as 16 weeks to create a breeding pool of dogs with tighter hip joints in successive generations. To obtain complete accuracy, the recommended age for screening is 6 months. A standard hip-extended radiograph is also included to investigate signs of OA.

Only PennHIP-certified veterinarians can officially perform the PennHIP procedure and enrol the radiographs into the evaluation procedure at the PennHIP Analysis Centre. PennHIP has a mandatory submission policy. After the radiographs are reviewed, a Hip Evaluation Report is mailed to both the veterinarian and the owner, who are informed of the Distraction Index (DI) of each hip and the grade of degenerative joint disease (DJD) (based on the looser of the 2 hips) relative to the other members of its breed. It is not a pass or fail system. Dogs with a DI < 0.3 are considered not to develop DJD in later life, whereas dogs with a DI of  $\geq$  0.7 are very likely to develop the disease. The chance of developing DJD in later life increases with increasing DI: > 50% of dogs with a DI between 0.3 and 0.7 develop DJD but some uncertainty remains, depending on breed characteristics. DI are breed-specific and are available from the PennHIP database.

Though well-established worldwide, breeding schemes reliant upon phenotype have shown a modest degree of improvement in hip conformation and reduced incidence of HD. The most successful implementation of traditional HD scoring has occurred in countries with mandatory scoring and open registries with access to pedigree records.

### ESTIMATED BREEDING VALUES

The closing decades of the last century brought a huge increase in the accessibility and power of computers. This provided a fantastic opportunity to use sophisticated mixed-model analysis to combine pedigree and phenotypic information to calculate the Estimated Breeding Value (EBV) for dogs used in matings, enabling more rapid improvement in multifactorial traits. HD schemes are just starting to use EBV and research in this area is growing rapidly in many groups globally and breeders around the world are increasingly embracing EBVs and the advantages they bring.

It is thought that until DNA-based genetic testing is available for HD, the incorporation of EBVs into current HD selection schemes should accelerate advances in hip and elbow improvement. Selecting dogs on the basis of a dog's genetic merit, will provide the breeder with greater selection power, accelerate genetic improvement towards better hip conformation and thus more likely decrease the prevalence of HD.

An animal's breeding value can be defined as its genetic merit for each trait, half of which will be passed on to its progeny.

While it is not possible to determine an animal's true breeding value, it is possible to estimate it. These estimates of an animal's true breeding value are called EBVs and is calculated from the phenotypes of the individual, their relatives and pedigree data.

EBVs are an animal's genetic merit for a particular trait relative to other animals in the same population. It is quite simply an estimation of the value of a particular golden retriever in a particular breeding program compared to other golden retrievers. With calculated EBVs a breeder may make more informed decisions about matings that should ultimately lead to greater improvement in HD.

EBV

-24

Confidence

98%

Score

6/5 =

Hip

The EBV is a more accurate predictor of an individual's genetic merit because it takes into account the genetic contribution of superior genes from all relatives (such as offspring or siblings) as well as any other available information about the individual in question.

The accuracy of an individual's EBV increases as information becomes available from its relatives. EBV confers greater selection power allowing accelerated genetic gain over time, compared to using individual phenotypic scores.

The NGRC is currently collecting hip scores of golden retrievers with the aim to EBVs as a breeding tool for golden retrievers in Australia.

If you like to be a part of this project please click <u>here</u>.



#### Version 1: February 2017

## National Golden Retriever Council Australia

(Hip Score)

## **ENVIRONMENT & NUTRITION**

Whether or not a dog develops HD and DJD/OA, and the severity of it, depends on both nature (a genetic component) and nurture (environment and nutrition) and there are things you can do as an owner to help prevent or reduce the severity of hip dysplasia in your dog.

Most importantly make sure you purchase your puppy from a registered breeder that is a member of the states breed club. These breeders perform the recommended screening and health tests and are aware of the problems within the breed.

Do not over feed your puppy! The number of calories your dog consumes, especially at a young age has been shown to have a significant impact on whether a puppy with HD genes will go on to develop the disease. Obesity can also increase the severity of dysplasia. Extra weight can accelerate the degeneration of joints, dogs allowed to grow overweight, will be at a much higher risk of developing OA. A balanced diet providing the correct nutrition in quantities that grows your puppy at an appropriate rate is vitally important.

Good muscle mass has been shown to decrease the incidence and severity of HD and access to off lead exercise has been shown to be a protective factor against HD. But activities that require your dog to jump or suddenly change direction or stop should be avoided because these activities are a risk factor and might result in flare-ups of clinical signs. Don't overexercise young puppies or allow then to frequently use stairs under 12 weeks of age. Don't allow your dog to exercise or spend significant time on slippery surfaces. These have been shown to be risk factors for clinical HD. Early neutering < 12 months has also been shown to be a risk factor in male golden retrievers.



This figure shows that 2 – 12 months is a critical time when environmental factors influence HD. The list of risk factors are the very sorts of things that are quite likely to happen in the puppy's new home. Over-feeding, changes in diet (yummy scraps from the table, lots of treats), inappropriate exercise, stairs which all can turn a little hip laxity into a lifetime of painful dysplasia.

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## SYMPTOMS OF HIP DYSPLASIA

A dog with HD may display one or a combination of the following symptoms:

| Clinical signs of HD<br>develop at 5 to 12<br>months for the severe<br>form. | With the chronic form<br>clinical signs develop<br>later. |
|--|---|
| Low tolerance for exercise   | Abnormal gait   |
| Audible "click" when walking   | Reluctance to climb<br>stairs                             |
| Bunny-hopping when<br>running  | Thigh muscle atrophy                                      |
| Increased width<br>between points of the<br>hips                             | Pain  |

## TREATMENT

Treatment of HD can be broadly categorized into surgical and nonsurgical management. Surgical options include juvenile pubic symphysiodesis (JPS), triple pelvic osteotomy (TPO), femoral head and neck ostectomy (FHO), and total hip replacement (THR). Nonsurgical management typically involves a multimodal approach including activity modification, weight reduction through dietary control, pain management, and pharmacologic modulation of joint disease. The decision on what treatment would best suit your dog should be discussed with your vet.

In respect to non surgical management a review of the scientific literature reveals weight management is an important aspect of preventing and managing OA and modulation of joint disease through the use of Polysulfated glycosaminoglycans , Mesenchymal Stem Cells, or possibly Extracorporeal shockwave therapy may be beneficial. What can also be gleaned from the literature is the need for studies investigating physical rehabilitation therapies, such as exercise and hydrotherapy, in dogs with HD and OA to determine if they have any value .

Surgery is frequently used to ameliorate the discomfort of OA resulting from HD, yet it remains unclear whether one surgical procedure is likely to result in a better outcome and should be recommended over another. Surgical intervention should be discussed thoroughly with your vet to determine which procedure is optimal. The method of surgical management frequently depends on the age of the dog on admission, the severity of clinical signs, patients behaviour, the surgeon's preference, financial constraints, potential risks and care required postoperatively.

When reviewing the current scientific literature on surgical management, it is clear that more investigation is warranted before conclusions can be made on the optimum management of these patients. To date the literature fails to provide an abundance of evidence to demonstrate that any surgical procedure will consistently allow a return to normal function for dogs with HD.

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Contact your State Breed Club for Further Information http://ausngrc.org/state-breedclubs/