Canine hip dysplasia (CHD)

Canine hip dysplasia is a complex developmental disorder characterized by joint laxity and osteoarthritis (OA) in one or both coxofemoral (hip) joints. The term dysplasia means abnormal growth, thus hip dysplasia means abnormal growth or development of the hips.

The polygenic, multifactorial etiology of hip dysplasia has challenged veterinarians and researchers since the condition was described in the 1930s.

There is no single cause of hip dysplasia; rather it is caused by multiple factors, some of which include genetics and nutrition. The abnormal development of the hip joint that occurs in young dogs with dysplasia leads to excessive hip joint laxity (looseness). This laxity causes stretching of the supporting ligaments, joint capsule, and muscles around the hip joint, leading to joint instability, pain, and permanent damage to the anatomy of the affected hip joint. If left untreated, dogs with hip dysplasia usually develop osteoarthritis (degenerative joint disease).

Dogs with hip dysplasia commonly show clinical signs of hind limb lameness, pain, and muscle wasting (atrophy). Owners report that their dogs are lame after exercise, run with a "bunny-hopping" gait, are reluctant to rise or jump, or aren't as active as other puppies. Many dysplastic dogs will show these signs early in life (6-12 months of age), but some dogs do not show signs of pain until they are a bit older.

The condition affects essentially all breeds, with an estimated prevalence ranging from 1% to 80% according to the Orthopedic Foundation for Animals. It occurs commonly in large breed dogs such as Labrador retrievers, German Shepherds, Rottweilers, and Saint Bernards, but it can occur in dogs of any breed and size, and even in cats. Thankfully, the best information we have is that hip dysplasia is very rare in pudelpointers.

So, what do we know? Here are four quick summary points about the state of current research:

***1) All puppies are born with perfectly normal hips***
Hip dysplasia is not a congenital defect; it is not present at birth. Multiple studies have demonstrated that puppies are born with "perfect" hips; that is, they are "normal" for a newborn with no signs of dysplasia. The structures of the hip joint are cartilaginous at birth and only become bone as the puppy grows. If a puppy is going to develop hip dysplasia, the process begins shortly after birth.

***2) The genes that cause hip dysplasia remain a mystery***
The varying prevalence of hip dysplasia among different breeds indicates that there is a genetic component to the disorder. However, scientists have been looking for genes that are definitively responsible for the development of hip dysplasia in dogs for decades without much success.

​Genes that are *associated* with hip dysplasia have been identified in some breeds, but they are breed-specific; that is, the assortment of genes is different in every breed. Genes that could *cause* hip dysplasia have not been found in any breed. Do they exist? Probably but nobody has proven it beyond a reasonable doubt.

Furthermore, it's unlikely that researchers are going to discover an easy genetic solution to the problem of hip dysplasia. It is a complex condition that is influenced by both genes and environment, and there is no simple solution just around the corner. Until a genetic test for pudelpointers is developed (and nobody should hold their breath for this) the best we will be able to do is to use selective breeding strategies that are as efficient and effective as possible.

***3) Environmental factors are also important***
Although there is a genetic influence on hip dysplasia, the heritability of the trait is rather low: not all dogs that have a genetic predisposition to hip dysplasia will definitely get the disease. Many studies have shown that genetic variation accounts for only a modest fraction of the variation in hip scores, usually 15-40%. This means that the majority of the quality of the hips is the result of non-genetic, or "environmental" influences. This is one reason why decades of strong selection has resulted in only modest reductions in hip dysplasia in some breeds. Hip dysplasia has many causes and while genetics is the single biggest one, there are others.

***4). Body weight is a major environmental factor***
If there is laxity in the hip joint, the amount of damage done to the femur and acetabulum will depend on the magnitude of the forces in the hip joint. The heavier the dog, the greater the forces will be and also therefore the higher the risk of hip dysplasia and osteoarthritis. Puppies kept on a restricted diet have a dramatically lower risk of hip dysplasia than their littermates that were fed normally. In short, don’t let your puppies get fat or grow too fast! A good rule of thumb here is that you should be able to feel their ribs but not see them. If you can see their ribs, they’re probably too thin. If you can’t even feel their ribs, they’re too fat.

Preventing hip dysplasia primarily focuses on breeding dogs with normal hips. The problem with this approach is that dogs often do not develop signs of hip dysplasia until well after they have been bred. A genetic test would be of great value in dog breeding but currently there is only such a test available for Labrador retrievers and it’s effectiveness has not been confirmed with independent research. For now, identifying dogs with less than stellar hip quality so as to exclude them from breeding is done via OFA and PennHip.

**What is OFA Registration?**

When purchasing a puppy, particularly one of a larger breed, often the parents will be listed as OFA Good or OFA Excellent. What this means is that the breeder has had the hips of the dog’s parents certified by the Orthopedic Foundation for Animals. The OFA is an organization with a goal of reducing the incidence of hip dysplasia, though now it is also possible to obtain certification for elbows, thyroid function, and other issues. The idea here is that a dog for breeding can have radiographs (X-rays) taken at age 24 months. The radiographs are sent to the OFA for review by several independent radiologists where they are graded. Hips that are rated as good or excellent receive a registration number. Offspring of OFA-certified parents would be less likely to develop dysplasia themselves, however, it is important to realize that a dog with excellent hips at age 2 may not have such excellent hips at age 5, 7, or 10. OFA certification is no guarantee that a dog will not develop hip dysplasia symptoms in the future and does not guarantee that the offspring will not develop hip dysplasia but until a DNA test for hip dysplasia is developed, parental certification is the best we can do.

In the minds of many veterinarians, OFA testing is deeply flawed not only because it is subjective (i.e. what one radiologist considers “Good” hips may not be the same for another radiologist) but also because it’s a very biased sample: not all radiographs taken by veterinarians have to be submitted to OFA for review, which means only the good radiographs get submitted and the obviously bad ones get deleted. This is the very definition of selection bias. For these and other reasons, most modern breeders have stopped using OFA testing in favor of the PennHIP test mentioned below.

**What is PennHip Registration?**

Many people with potential breeding dogs do not want to have to wait two years for OFA registration. The University of Pennsylvania Hip Improvement Plan, developed by Dr. Gail Smith, allows for another way to predict if a dog will develop hip dysplasia. For PennHip certification, the veterinarian taking the radiographs must receive special training and special equipment is necessary. The pet is anesthetized and two radiographs are taken: one with the femoral heads compressed (pushed into the acetabula as far as they will go) and one with the femoral heads distracted (pulled out of the acetabula as far as they will go). A measurement called a distraction index is calculated from these radiographs, the idea being that a tighter fitting hip - one allowing less distraction - is less likely to develop dysplasia. Each dog breed has a different range of distraction indices that are considered acceptable. Puppies can be certified as young as 16 weeks of age with this system. The results are numerical, instead of a subjective “Good” or “Excellent”, which addresses the subjectivity problem of OFA testing. Additionally, all radiographs taken during the evaluation are required to be sent to PennHIP for measurement, which addresses the selection bias problem seen with OFA testing.

With these imaging limitations in mind, there has been significant effort focused on identifying specific genes to use in conjunction with standard imaging methods for identification of hip dysplasia carriers. Genetic screening programs are complicated by the polygenic nature of hip dysplasia as well as environmental influences on phenotypic expression. A few promising genes for osteoarthritis (i.e. arthritis) associated with hip dysplasia in German shepherds have been identified relatively recently. Additionally, a genetic test was recently released for Labrador Retrievers but its accuracy has not been confirmed by other researchers. While the genetic factors of hip dysplasia remain elusive, significant progress has been made and likely will continue.

**Summary**

The anecdotal evidence we have is that hip dysplasia is NOT a widespread problem in pudelpointers. Ideally, the way to keep it this way is to test all breeding stock through either OFA or PennHIP and to use the results of these tests as a factor in a kennel’s selective breeding plans. For example, a male with a PennHIP distraction index of 0.65 would either not be bred at all OR be bred only to a female with a low distraction index. While these tests are not perfect, they are better than doing nothing. To a breeder who objects to doing OFA or PennHIP certification for cost reasons, I would ask simply this rhetorical question: if the test was free, would you do it?

The problem with waiting until we do have a problem with hip dysplasia and only THEN developing a requirement is that it will be too late. Because of the low heritability it can take decades to “breed out” something like hip dysplasia. In my opinion, prevention is always better than treatment.

In summary, and in my opinion, there are probably other things that should be higher on our list of things to discuss and develop protocols for than hip dysplasia. The hip dysplasia tests were developed in large part because of major problems in several very popular breeds.

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Additional information can be found here:

https://www.acvs.org/small-animal/canine-hip-dysplasia

https://www.cvm.tamu.edu/small-animal-hospital/orthopedics/orthopedic-services/canine-hip-dysplasia