

TFT Genetics
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Part 3: Demodectic Mange; Legg-Calve Perthes; von Willebrands Disease

Introduction

In Part 2 of this series I discussed a relatively recently defined genetic problem in Toy Fox Terriers called Congenital Hypothyroidism with Goiter (CHG) and discussed the pros and cons of testing for this disorder in your breeding stock. In this essay I will discuss some other genetic disorders (or in some cases multifactorial disorders with a genetic component). These are Demodectic Mange, Legg-Calve Perthes, and von Willebrand's Disease. In the next essay I will discuss Patellar Luxation, Progressive Retinal Atrophy, and Autoimmune Thyroiditis.

I defined a lot of technical terms in the first two essays in this series and I would encourage you to review them before reading the rest of this article. Before discussing additional genetic disorders I need to define two more terms that will be important in the discussion. The first is **variable expressivity**. This term simply refers to the fact that different individuals with the genetic makeup to have a disorder may show variability in the severity of the disorder. The second term is **incomplete penetrance**. This term means that some individuals with the genetic makeup to have a disorder will not have it at all.

Now that we have some common understanding of terms, we can discuss the specific disorders that occur in Toy Fox Terriers.

Demodectic Mange

Demodectic mange, usually occurs in puppies and, in the common, localized form, is easily treatable, especially in short-haired breeds such as the TFT. The mite that causes the disease is found on virtually all dogs and is passed to puppies by direct contact with the mother. It is not an inherited disorder but a low-functioning immune system, leading to symptoms (demodicosis) can be. In puppies, demodicosis is usually localized and easily treatable. The hair loss associated with it is usually temporary (unlike in some coated breeds where a more permanent loss of hair causes this to be a more serious problem). Some veterinarians recommend (some very insistently) eliminating individuals with a history of producing puppies with demodicosis from breeding programs. However, given the large numbers of affected individuals this could drastically reduce the gene pool. Furthermore, it is been our experience, and that of most TFT breeders, that once it has occurred in a puppy and has been successfully treated, it almost never recurs. Since it has no lasting effect on the health of the dog, it should be of little concern, beyond the ability to recognize and treat it, to most breeders. A more serious concern is the adult-onset form of demodicosis, which is frequently associated with cancer or other internal diseases. However, unless the underlying condition is hereditary, there is no indication that this more serious form is itself a major genetic concern.

Legg-Calve Perthes

Legg-Calve Perthes (LCP; also known as Legg-Perthes) is a degenerative hip joint disorder with a result similar to, but a cause different from, hip dysplasia. It is extremely rare in the breed. It is believed to be the result of an **autosomal recessive** gene and thus requires the mating of two **carriers** to produce an affected animal. Even then, only 25% of the offspring of such matings should be

affected. Because the gene also exhibits **incomplete penetrance** (i.e. not all individuals who have the genetic makeup {**genotype**} to be affected will actually be affected) the probability of producing affected individuals is reduced even further. Since there is no genetic test for this disorder, little can be done to reduce the incidence of this disorder except for vigilant observation by breeders and elimination of affected individuals from breeding programs. Furthermore, the occurrence of an affected individual also identifies the parents as asymptomatic carriers. Breeders must then make a decision as to whether to eliminate the identified carriers from their breeding programs (I made some recommendations about testing and elimination of CHG carriers from breeding programs in Part 2 of this series and will summarize those recommendations again at the end of this article). However, at a minimum two individuals that have been identified as carriers should not be bred to one another.

von Willebrand's Disease (vWD)

Von Willebrand's disease (vWD) is an inherited disorder which renders affected individuals more likely to bleed excessively because of the lack of a specific clotting factor (von Willebrand factor {vWF}) in the blood of affected individuals. The mode of inheritance has not been completely established. Some studies suggest that the disorder is an **autosomal recessive** disorder. However others have suggested that the disease, which has 3 forms, shows differential inheritance patterns for the different forms. These latter studies suggest that the most common form (Type I vWD) may actually be an **autosomal dominant** disorder with **incomplete penetrance** and/or **variable expressivity**. Therefore, animals getting the gene from either parent may show varying degrees of symptoms and will generally have reduced but measurable levels of vWF (1-60%). In the homozygous condition it is generally lethal with puppies dying before birth or shortly thereafter. The other two forms (Type II and Type III) are rare and are truly **autosomal recessive** disorders. In these two types, animals are only affected (with severe bleeding disorders) if they inherit the abnormal gene from both parents. **Heterozygous** individuals are **clinically normal asymptomatic carriers** even though they may have reduced levels of vWF. Because of the variable severity, vWD is often not diagnosed until the dog is several years old. There are tests that can be done. Genetic testing can be done in some breeds but, to my knowledge, not yet in the Toy Fox Terrier. Testing for vWF levels in blood samples can be done for any breed. Severity of Type I vWD depends on vWF levels, breed, and age and therefore, are not always readily interpretable. The disease cannot be cured but, in most cases, can be managed. Management procedures include applying prolonged pressure to wounds, cautery, transfusions of vWF, and thyroid supplements if the condition is associated with hypothyroidism. Aspirin, ibuprofen, and other drugs that affect platelet function, and therefore affect blood clotting, should be avoided. Breeding recommendations range from elimination of carriers from breeding programs to only eliminating affected individuals.

To Test or Not To Test?

Of the three disorders discussed in this article only one (von Willebrand's Disease) can actually be tested for the existence of carriers. One (Legg-Calve Perthes) can only have carriers identified when affected dogs have been produced. The questions then are:

1. Where possible, should all breeding dogs be tested; If not why not?
2. Should all dogs identified as asymptomatic carriers (either by testing or by producing affected offspring) be automatically eliminated from breeding; If so, what will be the consequences to the breed?

My recommendation for Demodectic Mange is treat it but don't let it affect your breeding program.

My recommendation for LCP is that once carriers have been identified by producing affected offspring do not use either the carrier parents or the affected dogs for breeding since this is a structural fault that we need to eliminate from the breed as much as possible.

My recommendation for vWD is basically the same as my previous recommendation for CHG:

1. Test your foundation breeding stock. If none are carriers then you never have to test any of their offspring because only carriers can produce more carriers (or produce vWD-affected pups).
2. If you bring a new dog into your kennel as a breeding dog, be sure that it has been certified not to be a carrier (either it has been tested and found not to be a carrier or its parents were tested and neither one was a carrier).
3. If you breed one of your dogs to one at another kennel be sure that the other dog has been certified not to be a carrier.
4. Under these circumstances, testing is a one-time thing that you will not have to do again as long as you never breed to a carrier.
5. However, if you test one of your dogs and it is a carrier you have several options:
 - If it does not have other characteristics that you really want as part of your breeding program then don't breed it; have it spayed or neutered and place it as a pet.
 - If it has some desirable characteristics but so do others of your dogs that are not carriers then don't breed it; have it spayed or neutered and place it as a pet; use the other, non-carrier dogs instead.
 - If, in the rare circumstance that it has desirable characteristics that you do not have in other dogs, or that you know from previous breedings it readily passes on to its offspring, then breed it (but not to another carrier. However, remember that if you do breed it (even to a non-carrier), you should, as an ethical and responsible breeder, test any offspring that will be kept or sold as breeding stock, since they have the potential to also be carriers. You should also inform prospective buyers of the results. If you do not want to test such offspring yourself then you should at least inform prospective buyers that the offspring may be vWD carriers and let the buyers make an **informed decision** as to whether to buy. Remember that you do not need to test puppies that will be sold as pets and spayed or neutered. Even though there is the possibility that they may be carriers, they will have no vWD-related health problems and therefore, do not represent any increased risk of veterinary expenses to the new owners.

The bottom line is that testing and elimination of carriers from your breeding stock is best if you can do so without losing desirable characteristics that you may have worked long and hard to bring into your breeding lines. If you cannot eliminate a carrier without losing something else important to your breeding program then at the very least don't breed it to another carrier and be prepared to test all offspring that will be kept (or sold) as breeding stock.

In the next installment of this series I will discuss several other genetic disorders or disorders with a genetic component. These include Patellar Luxation, Progressive Retinal Atrophy, and Autoimmune Thyroiditis.