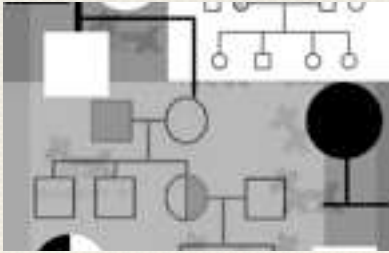


The Genetic Pedigree: a powerful tool against canine genetic disease - Part 4 of 4



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Part 4 in a series of 4

As a breeder of purebred dogs, you don't need a PhD in Genetics to understand that your job comes down to a balancing act between selecting for the traits you want, and selecting against the traits you don't want. Easy to say, but not so easy to do.

In fact, one of the measures of the real difficulty of dog breeding is the current alarm among breeders and buyers about the increasing amount of genetic disease in just about all breeds. And the concern that nobody seems to be able to do much, if anything, about it.

Common wisdom about getting rid of a genetic disease like hip dysplasia in your line is to try to breed away from it by finding dogs which seem to be unaffected by, or clear of, the disease. It's an approach that works fairly well, unless one or both of the dogs happens to be carrying defective genes.

And, unfortunately, canine geneticists tell us that all purebred dogs carry several defective genes. So trying to reduce genetic disease in your line by selecting apparently normal dogs will, at best, move you towards the breed average for the disease you are worried about. At worst it will bring even more defective genes into your line. Imagine trying to fix your car's engine by randomly swapping parts from your neighbor's car.

The only really effective way to attack the problem of genetic disease is to actively select against the defective genes, rather than trying to select for the most normal dogs you can find. It's a way a thinking about breeding that seems counter-intuitive, until you realize that if you know who the affected and carrier dogs are among the close relatives of the dogs you want to breed, you can lower your risks dramatically by making smart choices.

That's why breeders (and puppy buyers) show more and more interest in having dogs screened for genetic disease (using conventional diagnostics as well as the new genetic testing) and in sharing that health information openly. Why share the information? Because you can't select against the defective genes unless you know which dogs are carrying them.

But whether that health information is in an open registry, or penciled into notebook as a result of hours and hours of research and detective work on your part, you still need a way to visualize the relationships between the members of a dog's family in order to figure out where the least amount of risk is.

That's the beauty of what is known as a genetic, or geneticist's, pedigree. This is not the traditional lineage pedigree that lists parents, grandparents, etc. It's a chart of close relatives that shows in as much detail as possible which dogs do, and don't, carry defective genes. This tool is invaluable if you are trying to select against a polygenic disease like hip dysplasia. Even though you can't tell how many of the genes that create hip dysplasia a dog may be carrying, you can, with enough information about affecteds, make a relatively strong assessment of risk. For a single gene disease like PRA, you can do an even better job of predicting risk.

Remember that you are selecting against defective genes, and not defective dogs. You need to be able to preserve as many of the good traits of a particular dog as you can. So you can use the genetic pedigree to analyze the risk of whether or not a particular mating will increase or decrease the probability of producing carriers and affecteds in the puppies. You may be able to preserve the traits you need from a sire, but select against genetic disease in his line by mating him with a dam with a very low risk for passing along the defective genes. (But you must evaluate the puppies!)

"So, now I can look at the geneticist's pedigree and see at a glance what genetic defects my dog, Kyra, has in her lines," says White Shepherd breeder Judy Huston, the health and genetics chairperson for her breed club. But that's only a part of the job, Judy explains. "What's next? Now I need to make a list of the potential studs and find out what their defects are. Oh no, not again! I thought I was finished. But the good news is that these dogs are related and most of their information I already have--but not all of it. So, more email goes out, more requests for information and more willingness on the part of the breeders to help me out."

The genetic pedigree can be as simple as a chart of a dog's parents and littermates. Or as complicated as a 10-year overview of the entire family of a dog, listing a hundred relatives and all the litters produced by all matings, and showing carriers, multiple traits, deaths, birth dates and more.

“Collecting the information to draw a genetic pedigree based on data in an open registry requires several steps”

Below is an example of a very simple genetic pedigree, based on information from a GDC KinReport™ (GDC maintains a national and international open registry and provides health information on a dog and its close relatives). For information on how to draw and use a genetic pedigree, see Dr. George Padgett's recent book, *Control of Canine Genetic Diseases* (Howell Book House, 1998).

Collecting the information to draw a genetic pedigree based on data in an open registry requires several steps. The first would be to search the GDC, OFA or other registry database for the dog you are interested in to find out how many close relatives are also registered. If you find a dozen or more, you would then order the GDC KinReports™ that cover those dogs. If you are looking at the OFA registry you can print out the pages of the families you are interested in. You can then draw the pedigree and include the evaluations for each dog. You could then fill in missing information on a litter, perhaps, by contacting the breeder or other sources. (As of 2006, GDC will be offering a computerized genetic pedigree creation service. (Contact George Packard, GDC, gdc@conknet.com)

As an example of a basic way to use a genetic pedigree, let's say that this one shows information on a simple recessive trait such as PRA (progressive retinal atrophy). Each darkened square or circle is a dog affected with PRA, but we need to figure out which dogs may be carriers. If one of the puppies is

affected, it means that both parents carry the gene. Remember that unless you have a DNA test for PRA for your breed, you can't tell if a parent is a carrier until he produces a puppy that is affected.

Because a puppy in Litter C is affected, we know that both Ann and Art are carriers. And because two puppies in Litter H are affected, we also know that Bob is a carrier. Using the same logic, you can use the genetic pedigree to learn a lot about these dogs. Note that there is only full information on one litter in this pedigree. And that litters K and L are very important, but there is no useful information currently in the registry. Registries are only as good as the amount of information in them, and that is why GDC emphasizes registering entire litters.

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