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Genetics I. Introduction

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(Dr. Padgett is a Professor in the Department of Pathology, College of Veterinary Medicine at Michigan State University. This article is reprinted, with his kind permission, and was the first of a series which forms the nucleus of a far more complete and complex presentation on this and related subjects. Here Dr. Padgett attempts to outline the problems that interfere with or hinder an objective approach to control of genetic diseases in general and, in this case, specifically cataracts.)

The first and major hindrance to recognizing the significance and cost of genetic disease is that most breeders believe that the MAJORITY OF DOGS ARE GENETICALLY NORMAL. This is not the case at all. In dogs, we do not have good estimates of the number of defective genes they carry, but it is estimated that each human being carries three to five major defective genes. It is likely that, as a minimum, each individual dog is equivalent to humans in this regard. Aside from what is likely to be the case, if you believe most dogs are genetically normal and you find out your dog carries a defect, whether it's cataracts or something else, you do not want to talk about it because you believe your dog is different (less worthwhile) than MOST dogs.

This belief causes a person to be secretive about a trait, to deny that it occurs, and, as a result, to fail to address the defective gene as a problem which can be solved.

It is difficult to convince breeders that ALL dogs carry defective genes because people tend to hide problems and thus they are not an obvious part of the productivity of a dog or a kennel. However, the elite of the breed, the superior dogs, those that contribute a disproportionately high number of genes to the gene pool of the breed, allow us to get a better look at the problem for two major reasons. The first is that a good stud is used on bitches outside the control of the owner of the stud and thus the offspring of the stud are observed by multiple people and with multiple people it's hard to keep a secret. As a result, GOSSIP occurs. It may be true (also may not) but it's treated as gossip and sort of whispered rather than being openly discussed. Alternatively, a stud of lesser quality and thus not as well used, producing, say, two litters, may well have expressed the identical gene but the gossip is controlled (only two

breeders are involved). The second reason relates directly to the first. For a genetic disease to exist in a breed, there must be affected dogs, carrier dogs (heterozygotes, those having one gene for the trait), and dogs normal for both genes existing within the populations. Obviously, a dog bred more widely has a better chance to contact a carrier bitch and thus give the trait a better chance to express itself than a dog that produces one or two litters, even though both dogs are themselves carriers [controlled test matings may be the only way to establish who's who].

As a result of these two major features of genetic diseases and dog breeders (i.e., odds of producing a defect and gossip), you cannot name a single major dog in my breed that has produced 200 puppies or better (40 litters, 5/litter) that has not produced some defect (try it, see if you can think of one). Further, once you know the dog has produced a recessive defect, then you know that each of his puppies has a 50:50 chance of being a carrier for that defect whether the puppy was born before the stud produced the defect or after he produced it.

What breeders most often forget, however, is that the reason you know a superior dog has a defect is that the dog is in fact superior. He is used more often than dogs of lesser status because he produces winning offspring. He adds quality to the breed or he would not have been allowed to produce so many puppies (remember, this is controlled by the owners of the bitches, not the owner of the stud). WE now have 200 puppies on the ground, many of which are already champions (or you wouldn't have 200 puppies on the ground!), half of which are carriers. The owners of these dogs have already made a large investment in them and now they do not want to talk about any defects involving their dogs. What I call "THE CODE OF SILENCE" is imposed; it is unethical to talk about defects, owners that talk about defects are anathema, breeders that admit their dogs have or carry a defect are hounded by others no matter what quality the dog nor how healthy the dog. The stage is set for what breeders do best to one another: THEY LIE TO EACH OTHER or they prevaricate or they do not involve themselves in "useless" discussions or they fib or they do anything they can to avoid the fact that THEIR dog carries a gene for a given defect or may in fact have the defect (if it cannot be observed without special techniques).

This is the dilemma that dog breeders face no matter what the breed, no matter how famous the dog. ALL DOGS HAVE DEFECTIVE GENES LIKE ALL PEOPLE HAVE DEFECTIVE GENES. The question now becomes what should you do about it and what can you do about it?

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Dog breeders in general ... cause defective genes to spread within a breed by failing to approach genetic defects in an open manner. They control the matings of their dogs, but somehow they end up expecting "nature" to correct defects in the same manner natural selection works in a wild population. If "nature" bred their dogs there might be some basis for the belief that a disease such as cataracts might be corrected over a period of one or two hundred years by natural selection. The fact that none of the breeders (having the belief that natural selection is protecting them) would be alive when it happened doesn't seem to faze them.

The figure below (NOTE: not able to reproduce this figure for the health web page) shows the rate at which a recessive trait would disappear from the general population if you had absolute control of the situation and could make sure that no affected individual ever reproduced. This particular figure is taken from Curt Stem's text, Principles of Human Genetics, and a similar figure is presented in Hutt's book, Genetics for Dog Breeders on page 198. The rate of decline of the trait (i.e., the curve) is the same no matter what percent of the disease you start with. In 10 generations (20 or so years in dogs) the incidence of the disorder would decline about 75% if nothing else occurred (such as mutation) to balance the decline. That's why diseases like cystic fibrosis of people do not disappear even though "nature" prevents reproduction by most people who have this trait. Cystic fibrosis is still the single most common genetic disease of people. Unfortunately, there is no evidence that a trait was ever controlled by this mechanism in dogs or in any other species since no one has absolute control over reproduction.

TRAIT'S WILL NOT DISAPPEAR BY THEMSELVES. NATURE WILL NOT SAVE YOU BECAUSE NATURAL SELECTION HAS NOTHING TO DO WITH DOG BREEDING.

Dog breeders in general need to face genetic defects as a realistic part of the problems encountered in the process of producing good sound animals. We need to quit whispering about defects and gossiping about defects and instead set up a sound program that allows the standard selection procedures to go on so that we breed good dogs and avoid major defects.

[Bearded Collies] as a breed have only a few major defective traits [around 7], compared to 30 or 40 in several breeds. The average for genetic defects in each breed is about 14.

The decision that needs to be made is, do you want to control what you have or shoot for 30 or 40?