

Population Genetics and Popular Sire Effects

By David Post, DVM,MS 2007 Texterterriers.com

All breeds of purebred animals are the product of inbreeding. That is how breeds are created. An outstanding individual is identified and a breed is created around him or her. Most breeds of purebred dogs are less than 150 years old. During the late 1800s is when the concepts of “purebred” began to develop and the advent of dog shows started. Some breeds have older heritages, but the concept of “pure” existed only rarely. As purebreds were developed and breed registers were closed, the pools of genetic material available was automatically limited. Usually, early in breed creation, an outstanding individual dog becomes a “foundation sire” and most, if not all, ancestral lines in any current example of the breed will trace to that dog. With Airedales, most ancestral lines trace to Airedale Jerry, a dog from the 1890s. So we created a breed, what now?

As breed development continues, other outstanding individuals are identified, often they are big show winners. They also are widely used at stud and they improve the breed. Lower quality genes are reduced or eliminated. But the gene pool shrinks. As time passes, these dogs end up in most ancestral lines of current dogs. Then another generation of dogs comes along, with more big winners. The big winning stud is widely used. The gene pool narrows. The pattern continues. This gives rise to two fundamental problems with purebred dogs.

The obvious problem is the reduction in the gene pool making the frequency of all genes more concentrated. This is good for genes with no detrimental consequences. However, there are no perfect dogs and all dogs carry some genes for detrimental traits. These genes increase as a percent of the gene pool and problems begin to appear in the breed that had not previously been common. Since most breeders these days have small breeding programs that produce only one litter a year or less, the ability to identify carriers and remove them from breeding programs is both difficult and heart wrenching.

The less obvious problem of the “popular sire effect”, is the genetic impact and change that a single stud can have on a breed. If a particular big winning dog has some extraordinary trait, it becomes widespread in a

breed, to the point that it changes the breed. An example would be a lot of coat in Cocker Spaniels. This characteristic might make beautiful grooming more spectacular and make for big wins at dog shows. But such a trait would not be correct in a field dog. Yet the impact of the big winner changes the breed. Cocker spaniels now routinely need to be shaved, including their heads and faces and have hair that drags the ground. None of this was characteristic of the original breed. The breed has changed. In German Shepherds, the low slunk appearance of the rear end became a winning dog show fashion in the breed and the breed changed. Turns out this trait is associated with increased hip dysplasia in the breed and the breed has now been replaced by other breeds for most working functions. There were original big winners that were widely used in both breeds that introduced these changes.

So how to address these problems? Population geneticists sometimes suggest always attempting to breed dogs that are as little related as possible to maintain maximum diversity. The problem with this approach is that the phenotypes (appearances) of these maximally unrelated individuals is often quite diverse also. This makes breeding a consistent type difficult, if not impossible. A more practical solution, is to have a number of independent, linebred breeding programs in the breed. With several of these genetically independent, but quality programs operating the genetic diversity of the breed can be maintained, yet consistent quality can be produced. This approach requires that strong willed breeders avoid breeding to the current big winners from other programs, even when the fashion trend at dog shows moves toward the current spectacular dog. This protects the breed from both detrimental effects of popular sires, reduction in the gene pool and changing the breed type in detrimental ways of current fads and fashions at dogs shows.

Unfortunately, few breeders operate breeding programs big enough to maintain genetic independence. This requires that co-operative groups form with related dogs that interbreed within their programs, only out-crossing to outside dogs when it is genetically necessary to maintain vitality and type. Co-operative programs are difficult to maintain over time and unfortunately few exist.

Another difficulty is that few small scale breeders are strong willed enough stay away from the big winners. Breeding to these dogs makes pedigrees “prettier” and pups easier to sell. It also enhances opportunities at

upcoming shows since your pups are likely to resemble their recent big winning sire. Most breeders will fall into pursuit of breeding to the big winners or their winning offspring, which has the same genetic effect on diversity. This is why the independent programs need to be identified and encouraged for the well being of the breed.

Judge education is key to successfully protecting a breed. Big winners, with hundreds of thousands of dollars spent to promote show careers, often have exaggerated traits that make them stand out from the crowd. These exaggerations are often incorrect, even if they are exciting to observe. Think Cocker coats and German Shepherd hips. Judges are incorrectly influenced to pick these heavily promoted dogs and worse, dogs that look like them in the exaggerated trait, but who lack the overall quality.

In Airedales, there are very few independent breeding programs. Most top programs have lots of recent big winners in their pedigrees, including Texter. The traditional way for American breeders to maintain diversity is with the importation of dogs from England. Until recently, England restricted the importation of dogs into their country with 6 month rabies quarantine laws. This meant that they had little American Airedale genetics and their dogs were great out-crosses for us. Recently, their restrictions have changed and they now have American bloodlines. The same is true of Australia. This “shrinking of the Airedale world” has very positive aspects, but it tends to reduce the overall breed diversity. Breeders must become more aware of this issue. Breeders need to be more cautious in the promotion of top dogs and more cognizant of population genetics and popular sire effects. Bravo True Grit, an outstanding winner of the early 1980s is in the pedigree, multiple times, of almost all current winning dogs all across the country just 25 years later. It is difficult to find any Airedales that have not been influenced by his genetics. It would also be easy to argue that his style changed the breed. The appearance of dogs since that time is markedly different from dogs of the 50s and 60s. Since Grit, there have been a couple of other big winners that are already in the majority of pedigrees of current winners. And the gene pool shrinks. And the breed changes? We need to be careful! We need to encourage those independent programs and encourage them to stay independent. We need to encourage the development of new, independent, cooperative breeding programs that don't chase the latest big winner.