

## Breeding for Genetic Health

***"In the best interest of the breed, the numbers of litters a dog sires could be limited."***

by Carole Adley

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In my travels to the shows since I became a Canadian Kennel Club Director, I have had a lot of time to talk to people in many breeds, and their main concerns are the health problems, genetic defects and longevity of their breeds. In some breeds these problems seem to have reached epidemic proportions.

It was reported in a letter in English Dog World that in a study carried out in Cavalier King Charles Spaniels, 57% were found to be suffering from heart murmurs by the age of five years. In Sweden the problem is even worse, and a study there concluded that this problem probably originated from one or more of the foundation dogs in the 1920s. Many breeds have a multitude of problems, and it appears that some of the most affected breeds are those which arose from a very limited number of foundation animals.

I have been involved with Salukis for 35 years, and in that time I have seen them go from a breed with virtually no health problems and a 15-year life span to a breed suffering from frequent early sudden death from various causes (common enough to have been labeled Saluki Sudden Death Syndrome with a research fund set up) and many other health problems such as thrombocytopenia, thyroid abnormalities and allergies.

The saluki, although a very ancient breed that spanned a wide geographical area, went through a genetic bottleneck and exists in our "purebred registered" world as a result of a handful of imports from the early 1900s and later, and although our four or five generation pedigrees may indicate that dogs may be not closely related, they are in fact descended from the same few individuals, and thus have a small gene pool. In the U.S.A. there have been numerous new imports from Arabia, not registerable of course, since they were not registered in their country of origin, but their fanciers have breed them and there are now some 200 unregistered Salukis of new bloodlines. So far, I have been told, these dogs show vigorous good health, outstanding hunting ability and longevity.

I have recently read Last Animals At The Zoo - How Mass Extinction Can Be Stopped by Colin Tudge (from my local public library) and the chapter on the theory of conservation breeding gives food for thought to breeders of purebred dogs, because with the small numbers of foundation animals in most breeds they are genetically analogous to small populations of endangered species.

Briefly, the most important principles in conservation breeding are first -- at the level of the individual -- that it is important to avoid inbreeding (including what we call linebreeding), brought about by mating of animals who are closely related to each other. Second -- at the level of the population -- it is vital for long term success to conserve genetic variation.

In humans it is estimated that one in 20 North European people -- an extraordinarily high proportion -- carry the recessive gene that causes cystic fibrosis, when inherited in double dose.

Since people do not usually mate with relatives, each carrier has a one in 20 chance of marrying another carrier, so the chances of two carriers marrying are one in 400. One in four children of such a marriage will have the disease. So we would expect to find that one in 1,600 North European infants is born with cystic fibrosis, which is precisely what we do find. If a recessive disease gene were carried by one in 50 people (which we would consider common enough) then the disease would appear only once in 10,000 infants. It is estimated that each human being carries an average of about six recessive deleterious alleles which would cause serious disease. Thus we maintain the health of the population by outcrossing, which minimizes the chance of

deleterious genes doubling up. We do not try to weed out all the carriers of all the diseases from the breeding population!

In dogs, we know how to test for specific problems such as hip dysplasia and eye abnormalities, but there are many other factors in a dog's genetic makeup which are unknown, and which may only come to light several generations down the line. At the same time, we are selecting for other factors such as working ability, temperament, and, of course, show ring success. Show ring success has traditionally been easier to achieve by line-breeding and inbreeding, which accounts for its popularity with show breeders, and by extensive use of the top animals, especially stud dogs. According to geneticists, the effective population of a group of animals cannot be more than four times the number of different sires. Thus if four stud dogs are bred to a total of 100 bitches, resulting in 500 puppies, the effective population is only 16. See how easy it is to dramatically reduce the gene pool of a breed? In a numerically small breed, the popularity and extensive use of a few stud dogs can produce a genetic bottleneck.

It is impossible to test for every deleterious allele a dog may carry, and it can be assumed that every dog carries some, therefore several generations down the line we may find, when we start breeding a popular stud dog's descendants to each other, that we have a genetic problem which has now been passed on to hundreds of individuals.

Overuse of a few dogs can also greatly reduce genetic variation, because of genetic drift. For example, take these 100 litters, and assume that the breeder in each case keeps the pick of litter for further breeding. Each of these puppies has received half its genes from its sire, and half from its dam. Thus, the other half of the dam's genes, which she did not pass on to this puppy, are lost forever if that is her only offspring that is bred. To retain as many different genes as possible in a breed, it is necessary to breed from as many different animals as possible.

In Europe some breed clubs have imposed a limit on the number of litters a stud dog may sire in his lifetime, in order to prevent the reduction of the gene pool and ensure the genetic diversity and health of the breed. Europe is fortunate to have geneticists who specialize in the study of dogs, and who have kept up with the advances in population genetics, and who share their knowledge with breeders. The breed club here could appoint committees to search out this knowledge to share with its members, and should be prepared to make recommendations to breeders, enforceable through the code of ethics, to prevent overuse of stud dogs and other breeding practices which could cause long-term harm to the breed.

Owners of stud dogs could also assume this responsibility and, in the best interests of the breed, limit the number of litters a dog would sire. I believe that this is the most important issue facing breeders today, and I hope you will think seriously about your breeding programs and the future health and welfare of your breed.

### **C. A. Sharp Is Winner of Golden Paw Award**

Aurora, Ohio, January 15, 2003...C.A. Sharp of Fresno, California, is the winner of the American Kennel Club Canine Health Foundation First Annual Golden Paw Award. Sharp's article, "The Rising Storm: What Breeders Need to Know About the Immune System," was selected as the top canine health article based on the judging criteria of clarity, information, and contribution. Sharp is the Editor of *Double Helix Network News* and the President of the Australian Shepherd Health & Genetics Institute, Inc. The author was one of 14 entrants to the contest, and the article was one of 20 submitted. Sharp will receive a cash award of \$1,000 and a plaque to commemorate the accomplishment. The article will be published on the AKC Canine Health Foundation website and in the Foundation quarterly newsletter. Sharp will also be invited to the February, 2003, luncheon of the

Dog Fanciers Club in New York City. Commenting on her award, Sharp said, "I am delighted and honored to be the recipient of the Golden Paw Award. The control of genetic disease is one of the biggest challenges facing purebred dog breeders today. I am grateful that my article has been recognized as a valuable contribution to that effort."