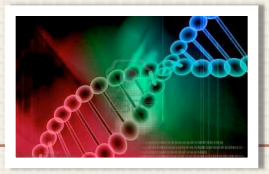
Understanding Recessive Genes



Recessive genes are responsible for many aspects in dogs, such as the production of blue or liver coats, and most do not affect the dog's physical well-being. A few however do cause health problems. Two have been described in Staffords – hereditary cataract (HC), causing blindness in young dogs, and L-2 Hydroxyglutaric Aciduria (L-2-HGA), a metabolic condition that affects the brain, causing seizures that may be misdiagnosed as epilepsy.

All dogs have two copies of every one of their thousands of genes with the exception of those on the sex chromosomes in the case of males. One copy of each comes from the sire and the other from the dam. The copies of each gene may not be identical but each will be at the exact same position on the appropriate chromosome. Differences between pairs of genes, mutations, are the result of little biochemical errors occurring somewhere in the replication process between generations.

With recessive genes the 'original' variant, let's call it 'X', produces the 'normal' effect as long as one copy of 'X' is present. If a mutation has occurred at some point, resulting in a recessive variant, 'x', then the normal effect will be produced as long as it is paired with 'X', 'X' is thus considered to be dominant to 'x', or putting it another way 'x' is recessive to 'X', X/X will naturally produce the normal effect but if x/x is produced then the resultant effect may be totally different.

With both HC and L-2-HGA three gene combinations are possible as you will have realized already –

X/X – the dog is clinically unaffected and is not a carrier of the condition, as it does not possess 'x', and thus cannot pass it to its off-spring.

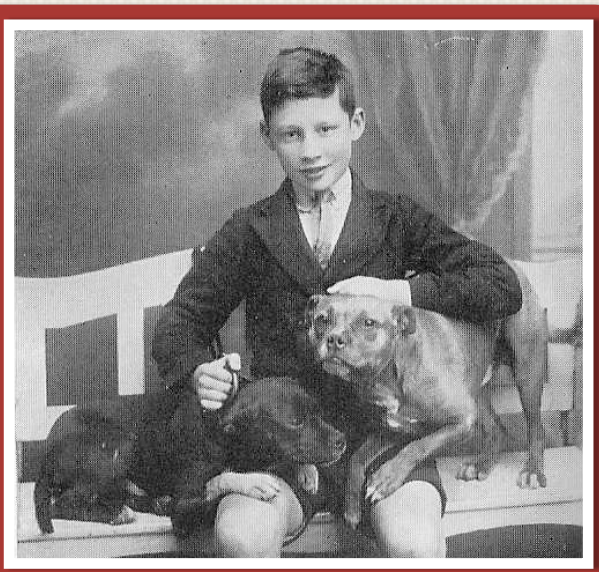
X/x – the dog is clinically unaffected but is a carrier as it possess 'x' which, on average, it will pass on to half its progeny.

x/x – the dog is affected with the appropriate condition and were it used for breeding it must pass the defective 'x' gene to all its progeny.

The aim of any control measures must be simply to prevent any clinically affected animals being born and eventually to eliminate the defective 'x' from the breeding population. With the development of laboratory tests for the recessive genes that cause the two conditions (tests of L-2-HGA are already available) the first step must be not to breed two carriers together – ensuring both sire and dam are tested prior to mating should guarantee this. Previously the only way of knowing a dog is a carrier is when it has produced affected off-spring. With careful selection, breeders, who have lines affected with either condition should be able to get rid of the defective genes within two or three generations while hopefully maintaining the quality of stock they desire.

Clearly not using any carriers at all in breeding programmes would soon eliminate the recessive genes for HC and L-2-HGA and some may advocate this. However, this would cause a possibly serious reduction in the gene pool, even in a breed like the Stafford that has a comparatively large pool, and could inadvertently permit the emergence of other genetic defects.

DR. ARCHIE BRYDEN



Tommy Westall photographed here with "Hyena" (puppy) and "Rum Bottle" (founder of B. Line) in 1923 - Please refer to our December Q&A on pages 30-31 for more info...