

## **Are Bull Terriers on their way to extinction?**

According to The Kennel Club Bull Terriers have an effective breed population of only 41.9 which means that it is at high risk of suffering detrimental effects of inbreeding. What on earth does this statement mean?

### **Inbreeding**

Inbreeding is the mating of related animals. All matings within a breed involve matings of dogs which are related to some degree since they are all related ultimately to the limited number of dogs which were used to found the breed. Indeed, in the origins of any breed the desired characteristics were bred for and fixed by inbreeding, without inbreeding no distinctive breeds could have been produced. So why has inbreeding suddenly become undesirable? To try to answer this question I will first look beyond the world of dogs to other species for examples of problems caused by inbreeding before returning to dogs.

Recent research has shown that Tutankhamun, the “boy king” of Egypt was the product of a brother-sister marriage - the Pharaohs considered that no one outside the royal family was good enough to marry a royal, and brother-sister matings were the norm over many generations. As we all know Tutankhamun died young, scientists have now documented some of the serious physical deformities and other illnesses which afflicted him. Perhaps the most famous example of the dangers of inbreeding is King Charles II, the last of the Hapsburg rulers of Spain. The product of 200 years of inbreeding, Charles’ tongue was too large for him to speak properly, his infamous Hapsburg jaw was so pronounced that he was unable to chew, and his intellect was somewhat lacking. The behaviour of his ancestors in choosing close intermarriages to protect the crown ended up terminating their line instead. There are lots of similar examples in other royal families from most parts of the world. In our current human society matings between relatives closer than first cousins are illegal - evidently we have learnt from experience! Problems of close inbreeding are of considerable concern when breeding from the limited stocks of zoological gardens. To take just one feature as an example, a study of mammals of twelve species in zoos showed that juvenile mortality in inbred strains was double that of outbred strains (1). In dogs, Willis quotes two highly inbred colonies in the USA: a Beagle colony where... "very high inbreeding caused the death by ten days of age of some 75 per cent of all pups born" and a Foxhound colony where... "inbreeding led to reduced sperm counts in males which in turn led to reduced litter size at birth." (2) Returning to Bull Terriers, inbreeding problems were noted several decades ago. In the 1930s and 1940s many of the best 'pure white' Bull Terriers, maintained as pure white lines since at least the 1860s, were observed to be lacking in vitality. Raymond Oppenheimer reached the conclusion that "... ceaseless white matings tended to a loss of substance and of pigmentation, as well as of head fill and power." (3) Tom Horner wrote that "In the early thirties many southern breeders of whites were line breeding pretty heavily, and along with the good heads and quality they were getting signs of deterioration in

some of their products, poor bone, lack of substance, poor pigmentation, slipping stifles and general effateness were quite common." (4) It seems probable that what Oppenheimer and Horner were observing in the inbred strains of white Bull Terriers was "inbreeding depression".

### **Inbreeding depression**

As a group of animals becomes increasingly inbred it loses versions of genes (alleles) which have not been selected for, so these alleles gradually disappear from the gene pool. Many of these alleles relate to polygenic factors (factors under the control of many genes) such as conformation, health and general vitality. The gradual loss of alleles from populations is known as "genetic drift", this is a random process which occurs naturally in all populations; it may not matter much in the large gene pool of a large population, but becomes increasingly serious over time in the small gene pools of smaller populations. Whilst some of the lost alleles may be deleterious versions of genes, the process may at the same time increase the proportion of other, mildly deleterious alleles, in the small gene pool, and thus increase the incidence of some diseases. However we may describe it, the ultimate result of inbreeding depression is a general lack of vitality. Scientists express the degree of inbreeding as a Coefficient of Inbreeding, which involves complex calculations, so it is often expressed in more readily understood measurements such as fertility and mortality. Clearly small gene pools are hazardous to the future of a breed (5). How small is the Bull Terrier gene pool? There may be many dogs but genetic analysis estimates their effective population as a mere 41.9. This is far below the level which is regarded as sustainable, *our breed is in real danger of dying out.*

### **What is the answer to the problem of excessive inbreeding?**

Since the days of James Hinks, the principal founder of the breed, white Bull Terriers have not merely been predominant, for many years they were virtually the only ones shown. Colour was re-introduced to the breed, mainly from the older style of dog now termed Staffordshire Bull Terrier between 1910 and 1925 (6). The whites had become so different from the old style coloured dogs that the coloureds produced by these crosses were of very inferior type, and were disregarded by most white breeders. Indeed the Bull Terrier Club tried to prevent them being shown, they were however, according to the Kennel Club, Bull Terriers, and could be entered in shows, competing with whites. In the 1940s Oppenheimer had watched the emergence from relative obscurity of coloured Bull Terriers which were then becoming increasingly successful in the show ring. The Bull Terrier Club's members were long against the use of coloured or colour-bred white sires on 'Pure White' bitches and undertook "not to breed from Brindle-bred Whites as a foundation for a 'White' strain, and upon selling Brindle-bred Whites to point out the disadvantages of having 'Coloured blood' in a White strain" (7). The Club maintained a 'Pure White Stud Book' to protect the purity of the whites (Tom Horner was the last keeper of the 'Pure White Stud Book'). So we had a situation where the breeders of coloureds could use the best whites but

the breeders of whites were unable to use coloureds no matter how good they were. Oppenheimer declared that "... I could see plainly that coloured blood carried with it factors for sturdiness..... I was now satisfied that the fate of the whites hung in the balance and that I must fight for what I knew to be vital to their ultimate survival" (8). Accordingly he led the move to free the Bull Terrier Club's members from the pledges cited above, and this was done at the annual general meeting in 1950.

Led by Oppenheimer, breeders of whites began to use coloureds in crosses, and the whites were soon restored to full health. He decided that the "brindle factor" was responsible for this and pushed his theory with vigour "... if breeders here or elsewhere in the world, ever forget the overwhelming importance of the brindle factor they and the breed will suffer severely." (9) Of course he was right that the coloureds had "saved" the whites but technically wrong in that it had nothing to do with the "brindle factor" it was all due to the outcrosses of the whites with the genetically different coloureds. As this brief excursion through Bull Terrier history illustrates, the answer to inbreeding depression is greater genetic diversity.

As an aside, we may note that the interbreeding between Miniature Bull Terriers and Bull Terriers to save the former breed whilst a DNA test was developed for Primary Lens Luxation, has resulted in such increased genetic diversity in Miniatures that their effective population size is now high enough to be officially described as *sustainable*. Their show quality has also improved dramatically, the best now look like genuine miniatures of their larger cousin Bull Terriers, which they very rarely did prior to interbreeding.

### **Effective population sizes and sustainability**

The Kennel Club quotes the findings of the Food & Agriculture Organisation of the United Nations, "*Breeding strategies for sustainable management of animal genetic resources*" ( 2010) in expressing the relationship between effective population size and the sustainability of breeds thus:

Effective population sizes which are over 100 are sustainable.

Effective population sizes between 50 and 100 lead to the warning "The rate of loss of genetic diversity within a breed or population increases dramatically when the effective population size is less than 100.

Effective population sizes which are less than 50 are "considered to be at high risk of detrimental effects of inbreeding." I will go on to quote the KC's expansion of this statement: "The breed is at risk of detrimental effects of inbreeding which could increase the chances of the breed being at risk for both known and unknown inherited disorders. The population is also at risk of inbreeding depression, which is an overall decrease in general fitness, or general health, and may reduce litter sizes and fertility across the breed."

Clearly, with an effective population size of only 41.9, the future of our breed looks bleak!

### **Breeders' choices**

The future of Bull Terriers depends on breeders' decisions. The more closely related are the sires and dams of the litters you produce the more likely you are to contribute to the gradual shift towards inbreeding depression in the breed. But you can't judge the closeness of relationships of possible mates from the ringside, and a layman's examination of three or even five generation pedigrees will not be much help either. So how can you take into account the extent of inbreeding in mating decisions? Easy, if you make use of the Kennel Club's *Mate Select* service you can check the extent of inbreeding involved in any crosses you are contemplating, examine it online on the KC's web site (10), it is free, easy to use and will help you to produce healthier litters whilst at the same time aiding the genetic diversity of the breed. Remember the old adage "always cross the best with the best" but please, at the same time have in mind the health of the stock which genetic diversity maintains or improves. Beware of the prevalent practice of chasing the current winners to sire your litters, the overuse of popular sires is probably the major factor leading to excessive inbreeding. Selecting sires which have the features you are breeding for but which are not too closely related to your bitch is the way to go.

Wouldn't it be ironic if inbreeding became so bad in our beloved breed that we had to seek interbreeding with Miniatures to save Bull Terriers!

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#### References

- (1) J. Ballou and K. Rails, Inbreeding, *Biological Conservation* 24, p 239 quoted in *New Scientist* 19.5.83 p 454
- (2) M. B. Willis, Inbreeding in the Dog, part iv - its disadvantages. *Dog World* 10.4.87 p8
- (3) R.H. Oppenheimer *After Bar Sinister*, Dog World Ltd., p111 (1969)
- (4) T. Horner, The Brindle Factor's Influence, Notts & Derby District Bull Terrier Club *Review* No. 4, 1987 p7
- (5) M. B. Willis, *Genetics of the dog*, H. F. & G. Wetherby Ltd. London (1989) *vide* The genetic consequences of inbreeding pp 327- 332
- (6) R. H. Glyn. *Bull Terriers and How to Breed Them*. Hall, p104 (6edn 1950)
- (7) R. H. Glyn. *op.cit.* p105
- (8) R. H. Oppenheimer. *op.cit.* p.67
- (9) R.H. Oppenheimer) *Bulletin of the Bull Terrier Club* 120. P.7 (1976)

(10) Mate Select <http://www.thekennelclub.org.uk/services/public/mateselect/Default.aspx>

“Estimated Effective Population Size Research Q & A” - paste this into the KC website to discover much useful information.