

27. Evolution of dogs

The fact that there are more than 350 breeds of dogs is often presented as a proof of evolution. In this case “natural selection” was not natural but performed by breeders who wanted to develop a breed with specific characteristics. This resulted in an incredible diversity of body shapes and behaviour patterns of all the different breeds. How did this happen?

Originally it was assumed that dogs were domesticated about 20,000 to 40,000 years ago. However recent DNA evidence shows that dogs are descended from the grey wolf, domesticated about 130,000 years ago. This means that wolves began to adapt to human society long before humans settled down and began practicing agriculture. It also means that humans influenced the breeding of dogs over a very long period of time.

What is the origin of so many breeds? Humans developed many different breeds because they needed dogs to have characteristics and functions to perform varying tasks such as hunting, defending, racing or for company.

Dogs, like every animal, are subjected to mutations. While natural selection eliminates mutations which reduce the chances of survival by killing off animals, humans, by providing food and shelter, can keep animals with a large variety of mutations alive. And because of human intervention we have so many breeds which would otherwise not be able to survive on their own.

How did this variety of shapes and functions of dogs originate? Are these new characteristics coded by new genes? The latest genetic research shows that many canine characteristics resulted from genes that were damaged by mutations.

In some breeds we can see a significant increase in muscle mass. This is caused by degradation of the Myostatin gene. Myostatin controls the growth of muscles in dogs. If the Myostatin gene is mutated it results in lower production of Myostatin and hence larger muscles.

We know that Labradors have an unrelenting appetite. By one estimate, nearly 60 percent of all Labradors are overweight or obese. A gene called POMC, which is known to regulate appetite, is responsible for this. Without it the dogs don't know when they've had enough, so they just keep eating. The mutation found in Labradors involves a short section of the genetic code of POMC being deleted. This has a catastrophic effect on the protein POMC produces.

Other damaged genes found in dogs include:

- long curly fur resulted from damaging three separate genes
- the size of dogs is controlled by 6 genes, 3 of them are damaged. All the mutant genes decrease the size of a dog

- a short muzzle is associated with damaging mutations in the THBS2 and SMOC2 genes
- short tails result from the mutated T gene
- dog friendliness is linked to the damaged GTF21 and GTF2RD1 genes
- yellow coat color is due to loss of the melanocortin 1 receptor.
- a black coat is caused by deletions in β -defensin

It is more likely that with further research more damaged genes will be found. The dog genome is only 0.04% different from the wolf genome. This would indicate that dogs have not evolved any new genes. Not all dog gene mutations are damaging, some are beneficial, but the benefit is determined by the breeder not by nature. Intelligence tests show that wolves are much better at independent problem solving than the dogs. This would indicate that some dog's brain genes are damaged or malfunctioned.

Dog breeding is a good example of the power of selection acting on hidden random mutations. On a molecular level we see that the majority of dog mutations selected by humans are very likely to be damaging, degrading or causing the loss of functions.