

Canine Autoimmune Disease

by

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What is meant by Auto Immune Mediated Disease?

Autoimmune Mediated Disease is essentially an umbrella term to describe a number of different diseases that result from the immune-mediated destruction of an important physiological function. The mammalian immune system is an incredibly complex system that protects against invasion by foreign bodies, for example bacteria and viruses. In order to achieve this protection, the immune system must have some way of recognising when something is 'foreign'. Often, the basis of identification will be a protein or proteins that form part of the foreign body, perhaps a protein on the surface of a bacterium or in the viral coat. In order for the immune system's discrimination to be absolute it must be able to recognise all of the foreign proteins whilst ignoring the tens of thousands of proteins that actually form the fabric of the mammal. This problem is often described as being able to distinguish between self-proteins, that is, those that form the normal mammalian make-up, from non-self proteins, those that are part of a foreign body that needs to be recognised and destroyed.

During the development of the embryo it is probable that the immune system learns what is self and learns not to react to self-proteins. This means that the immune system that operates after birth is geared to distinguish self from non-self and only mount an immune response to non-self that will, hopefully, result in the destruction of the foreign body carrying the non-self proteins. Autoimmune Mediated Diseases result from a breakdown in the immune system's discrimination such that it actually recognises certain self proteins as foreign and initiates the pathways that will lead to their destruction. Depending on the extent of destruction of these self-components, various consequences will ensue. Autoimmune Mediated Diseases occur when the destruction induced by the immune response to these self-proteins removes an important physiological function. For example, one form of autoimmune disease, autoimmune haemolytic anaemia, is the result of the recognition of a normal protein present on the surface of a red cell as foreign, non-self, and the resultant destruction of red cells by the immune system causes severe anaemia.

Are these diseases thought to be inherited?

Pedigree analysis certainly suggests that autoimmune diseases do occur more frequently in certain lines and this is one of the hallmarks of an inherited disease. However, the research to date is far from complete. Some in depth studies have been performed in certain breeds. For example, analysis of Bearded Collie pedigrees in America suggests that autoimmune disease could be inherited as a simple autosomal recessive condition, although for this interpretation to be valid the analysis assumed that there was incomplete penetrance, i.e. some genetically affected dogs never actually showed clinical signs. Other analyses of pedigrees in other breeds suggest a more complex pattern of inheritance, for example in the

Standard Poodle the mode of inheritance of Addison's disease appears to be polygenic, but with a major predisposing gene in the affected population.

So, the research is still not advanced enough to give precise modes of inheritance, but what is clear is that autoimmune mediated disease will have an inherited component to it. Unfortunately, it is not as simple as that because the research also shows strong involvement of environmental factors. I think a fair summary is that dogs inherit a genetic predisposition for autoimmune mediated disease, and that the mode of inheritance may well vary from breed to breed, but that for full clinical expression there needs to be some kind of environmental cue or trigger.

If there is doubt about the precise mode of inheritance of the genetic predisposition, there is even more doubt and debate about the so-called environmental trigger factors. One thing that can be said from recent research is that the 'health' of the immune system in general seems to be a critical factor. Anything that places stress on the system, for example an already ill dog, could act as a trigger for the clinical expression of an autoimmune disease in a genetically predisposed dog.

What are the implications of Autoimmune disease for dog breeding?

Unfortunately, we are still some way from a thorough understanding of the mode of inheritance of these problems and the possible environmental triggers that are significant. The good news is that there is research going on and progress is being made, but I think it fair to say that we are still some way off getting definitive answers and identifying specific genes that might be involved. In the meantime, breeders might have to cope with the problem using whatever information is available. I think most people would agree that breeding from an affected animal is not desirable. However, even this is not that straightforward because some of these conditions are late onset, occurring after a dog has been bred from.

The greater problem is how one deals with relatives of affected dogs. As with many inherited conditions, breeders don't have the best tools at the moment to address the problem through informed, selective breeding, which means that whatever is done has to be a compromise between limiting the spread of the problem to future generations whilst trying to ensure the production of future generations that display good breed temperament and type. As is always the case, individual breeders will have to approach the problem and make their own decisions, but there are certainly things that they need to consider very carefully. Should breeders really repeat matings where it is known that one or more affected dogs are present in previous litters? My view is 'no', but again it is up to the individual breeder to make the decision. I would also be very wary about line breeding to dogs that are known to have produced affected offspring. In these circumstances, line breeding will certainly increase the frequency of the genes responsible for the genetic predisposition and thus will likely result in the increase of autoimmune disease in future generations. I think that the final word is that if breeders do decide to breed from close relatives of dogs that are affected with an autoimmune disease, as well they might, then they have to research potential mates and their genetic background closely to avoid the risk of increasing the frequency of disease in future generations.

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