Man's best friend recruited in the hunt for disease genes

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For centuries man has had a uniquely close relationship with dogs – as a working animal, for security and, perhaps most importantly, for companionship. Now, dogs are taking on a new role – they are helping in the hunt for genetic mutations that lead to diseases in humans.

"Dogs get very similar diseases to humans," said Kerstin Lindblad-Toh of Uppsala University in Sweden and the Broad Institute of MIT and Harvard, Cambridge, Massachusetts. "If you ask a dog owner what sort of conditions their pets get, they will say cancer, allergies, eye diseases."

Lindblad-Toh was speaking at the European Science Foundation's 3rd Functional Genomics Conference, held in Innsbruck, Austria, on 1-4 October. Functional genomics describes the way in which genes and their products, proteins, interact together in complex networks in living cells. If these interactions are abnormal, diseases can result. The Innsbruck meeting brought together more than 450 scientists from across Europe to discuss recent advances in the role of functional genomics in disease.

Many canine diseases could share the same genetic basis in humans and dogs, Lindblad-Toh told the conference, and because dogs have been bred into clear isolated populations – the different breeds – it is often easier to detect a genetic flaw that leads to a disease than it is in humans. Once the rogue gene has been found in the dog, it could make it easier look for mutations in the same gene in man.

"For example we have found genetic mutation that results in a condition called day blindness that can affect dachshunds," Lindblad-Toh said. A similar condition can arise in humans, and analysis of the mutated protein in the dog is providing new information about the disease in man. The team is also looking at genes associated with cancer of the blood vessels to which golden retrievers are prone.

A new European consortium has been set up called LUPA, where twenty veterinary schools from 12 countries spread across Europe will work together to collect 10,000 DNA samples from purebred dogs, comparing healthy animals with those affected by similar diseases as human. The analysis of the genome of affected dogs compared to healthy ones of the same breed will lead to the identification of genes implied in the mechanisms of these diseases. The four-year project aims initially to pinpoint genetic markers for dog diseases and help to reduce the high level of inherited disease in purebred dogs. The identification of these genes implied in disease development will help to understand the mechanisms and pathways of the pathology.

For example in Sweden, more than one-third of English Springer Spaniels are diagnosed with mammary tumours, analogous to breast cancers in humans. An increased risk for malignant mammary tumours has been reported also in other breeds, including Cocker Spaniels, German Shepherds and Boxers, suggesting that these breeds may carry genetic risk factors for this type of cancer. If the genes implicated in the disease can be singled out this could provide a new opportunity to improve prevention, diagnosis and treatment of human breast cancer.

"We want to find a lot of risk factors and bring them back to human patients over the next few years," Lindblad-Toh said.

Source: European Science Foundation