More than 20 gene loci associated with canine hip dysplasia

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An extensive study on canine hip dysplasia conforms to the polygenic background of the disease. Genes located in different chromosomes have a strong association with a protein modification process previously

linked to inflammatory arthritis.

Hip dysplasia is a developmental disorder common in most dog breeds, and its onset is affected by both hereditary and environmental factors.

Prior studies have identified dozens of genetic loci associated with hip dysplasia in various breeds. The relevance of the loci to disease susceptibility remains an open question. The previously identified loci were reinvestigated at the University of Helsinki, Finland, using a large independent cohort of 1,600 dogs representing ten breeds. The individual genetic variants at the target loci were determined from blood samples. The standardized radiographic hip phenotypes as assessed by expert veterinarians were obtained from the Finnish Kennel Club.

"Key to the study was the opportunity to utilize the world's largest canine DNA bank maintained by Professor Hannes Lohi's research group. We validated the disease association of 21 loci from 14 chromosomes," says Professor Antti Iivanainen from Faculty of Veterinary Medicine, University of Helsinki. "Genes related to a protein modification process known as neddylation were overrepresented among the genes residing in the validated loci. This was an interesting new find."

Lea Mikkola, Ph.D., who wrote her doctoral thesis on the topic at the University of Helsinki, emphasizes that, genetically, hip dysplasia is a highly complex disease. "A multitude of genes affect the development of the disease. There are marked differences in the genetic background of the disease between breeds, even if certain gene loci associated with it are the same."

In the future, the researchers want to pay closer attention to the loci now identified as relevant to uncover the actual genes underlying hip dysplasia and their variants.

"The findings do not boost disease diagnostics or dog breeding as such, but they can likely be used as part of broader risk profiles in the future. The identified loci also contain new candidate genes associated with hereditary hip dysplasia in humans, which may eventually improve humans' care. More hip dysplasia studies should be conducted, through increased international collaboration, with different dog breeds," notes Professor Hannes Lohi from the Faculty of Veterinary Medicine and the Faculty of Medicine.

More information: Lea Mikkola et al. An across-breed validation study of 46 genetic markers in canine hip dysplasia, *BMC Genomics* (2021). DOI: 10.1186/s12864-021-07375-x

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