

The Domestic Dog: Lending a Helping Paw

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The domestic dog, in addition to being man's best friend, is of vital importance to human health. In recent years, the domestic dog has emerged as a powerful tool for the study of heritable human diseases. Due to the complexity of human genomes, understanding the genetic basis of many human diseases has proven to be a difficult task for researchers. Thankfully, the domestic dog is an ideal model for mapping complex human diseases because they exhibit a greater homology to the human genome than any other model organism, they are susceptible to many of the same disorders, and they have a convenient population to study. By studying the genetic basis of diseases in dogs, researchers can identify the causal genes that lead to diseases in humans, thus leading to effective treatments for humans and their loving companions.

Due to 200 years of selective inbreeding, dogs have developed into an ideal model for comparative genetics. The strong selection imposed by breeders to produce a homogeneous population of individuals with common morphological and behavioral traits has led to an excess of inherited diseases in domestic dogs. Consequently, breeds have a genetic predisposition for many diseases ranging from epilepsy, cancer, diabetes, and hip problems, to many more breed-specific disorders. Since dogs in the same breed share significantly larger DNA blocks than shared by any humans, researchers can look at fewer single nucleotide polymorphisms in fewer individual dogs to find a block of DNA that consistently corresponds with a disease. Thus, due to the similar genetic make-up within breeds of dogs, genome wide association studies are proving to be exceptionally powerful in understanding human diseases.

Currently, researchers with the Broad Institute are carrying out a dog disease-mapping project. Although they are in the process of investigating nearly 40 diseases in a variety of breeds, a large area of focus is on understanding cancer genetics in purebred golden retrievers. Nearly 60% of these purebred dogs develop bone marrow cancers, including mast cell tumors, hemangioma, and lymphoma. Researchers are hard at work collecting and analyzing DNA samples from both healthy and cancer ridden golden retrievers in hopes of uncovering the gene(s) responsible for such cancers.

Dogs are considered "man's best friend" because of their loyal companionship, but now they can provide much more. They are capable of furthering the development of modern science and increase their human counterparts' wellbeing.

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References

- Boyko, A. R. (2011). The domestic dog: Man's best friend in the genomic era. *Genome Biology*, 12. doi:10.1186/gb-2011-12-2-216
- Cyranoski, D. (2010). Pet project. *Nature*, 466, 1036-1038. doi:10.1038/4661036a
- Karlsson, E. K., & Lindblad-Toh, K. (2008). Leader of the pack: Gene mapping in dogs and other model organisms. *Nature Reviews Genetics*, 9, 713-725. doi:10.1038/nrg2382
- Neff, M. W., & Rine, J. (2006). A fetching model organism. *Cell*, 124, 229-231. doi:10.1016/j.cell.2006.01.008