GENETIC CONSIDERATIONS IN COMPANION ANIMAL NUTRITION

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Efforts to map and characterize the chromosomes comprising the canine genome have resulted in extraordinary progress over recent years. Today the map of the canine genome contains 341 well-spaced markers that provide an estimated coverage of over 95% (Werner 1999). The continued development of a high-resolution genetic map of the dog represents a key resource for identifying genes that control both health and disease. These efforts will result in additional diagnostic tests to identify dogs carrying these genes and allow veterinarians, breeders and owners to incorporate this knowledge into appropriate health care, nutrition and breeding practices that will minimize the occurrence of genetic disease and maximize the health and longevity of our pets.

More than 300 hereditary diseases have been described in dogs (Clark 1994, Foley 1979, Hoskins 1995, Kirk 1986, Nicholas 1987, Paterson 1980, Piddick 1987, Willis 1989). Many of these diseases have both genetic and environmental components that together influence the likelihood of an animal developing the disease. In some situations, nutritional strategies can be employed to reduce the risk of the onset of disease. The nutritional management of genetic disease is typically geared toward delivery of a nutrient profile which reduces risk of the disease in the genetically predisposed dogs or in managing the symptoms associated with the active disease process.

In the past, genetics and nutrition were considered two competing forces – nature versus nurture- in modulating the physiology of an individual. Today we know that it is the interaction of genes and nutrients along with other environmental factors that determine phenotype. The interaction of genetics and environment is the foundation for all health and disease. Nutrition represents one of the most modifiable risk factors influencing disease. As with human nutrition guidelines, companion animal nutrition guidelines assume that every animal is at equal disease risk. However, scientific evidence does not support this "one size fits all" approach. Effective strategies to reduce risk of disease will require the identification of individual animals that should be fed diets tailored to their specific dietary needs. Genetic tests are now becoming available to detect the presence of disease genes in dogs and cats.

Currently, the nutritional strategies are defined by the disease itself, i.e., the nutrient profile of a diet is developed to manage the symptoms and attempt to normalize the abnormal physiology.

As genetic knowledge progresses in the companion animal arena, we will learn more about the genes that are associated with various health and disease issues. Identification of these genes will result in advancements in assessing an individual dog or cat's predisposition to disease and other challenges it may face during its life. This knowledge will also enhance our understanding of the physiology underpinning health and disease issues, which will allow development of more effective nutritional strategy to reduce the risk of expression of genetic disease.

References

Clark R.D. and Stainer J.R. (1994). Medical and genetic aspects of purebred dogs. Fairway, Kansas Forum Publications.

Foley C.W., et al. (1979). Abnormalities of companion animals. Ames, Iowa: Iowa State University Press.

Hoskins J.D. (1995). Congenital defects of the dog. Ed: Ettinger and Feldman. Textbook of veterinary internal medicine. Philadelphia, PA: W.B. Saunders Co.:2115-2129.

Kirk R.W. (Ed). (1986). A catalogue of congenital and hereditary disorders of dogs (by breed). Current Veterinary Therapy IX. Philadelphia, PA: W.B. Saunders Co.:1281-1285.

Nicholas F.W. (1987). Veterinary genetics. Oxford, England: Oxford University Press.

Patterson D.F. (1980). Catalog of genetic disorders of the dog. Ed: R.W. Kirk. Current Veterinary Therapy VII. Philadelphia, PA: W.B. Saunders Co.:82-103

Piddick H. (1987). A review of inherited disease in the dog. The Veterinary Annual 27:293-311.

Willis M.B. (1989). Genetics of the dog. New York, N.Y.: Howell Book House.

Werner P., Mellersh C.S., Raducha M.G., et al. (1999). Anchoring of canine linkage groups with chromosome-specific markers. Mamm. Genome 10:814-823.