

Understanding genetics: why should vets care?

The genomes of hundreds of dogs have been sequenced, and the genomes of pedigreed and non-pedigreed cats are in the pipeline via the *99 Lives* Cat Genome Sequencing Initiative.¹ Most veterinary colleges teach genetics in their core curriculum. But why should a feline practitioner care about genetics?

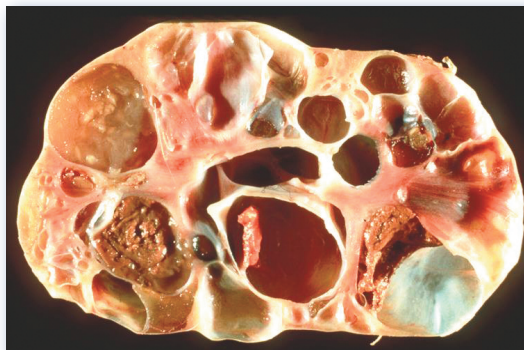
We live in an age where everything 'is in our DNA', whether you're a Sony high definition TV or a Jaguar automobile. A growing proportion of the general public understands that our good genetic make-up can be squandered by poor lifestyle and bad habits; but also, some people who have smoked a pack of unfiltered Lucky Strikes every day can live to the age of 84. Genetic testing can help us humans anticipate our health risk factors. It can do the same for cats.

We can already anticipate specific health concerns in feline patients using genetic testing for some diseases. DNA is the basis of life and the foundation of organismal biology. If you accept comparative anatomy, you must accept comparative genetics, as the majority of genes are the same in all mammals. Gene timing and regulation may vary among species, but only a few hundred genes out of 20,000 or so are specific to a cat.

Some defects, like polycystic kidney disease, are obvious problems with a genetic basis that can be readily appreciated by cat owners and veterinarians alike. But there are other diseases, such as feline infectious peritonitis, lymphoma, asthma, diabetes and inflammatory bowel disease, where the importance of genetic predisposition is less intuitive. But you can bet your bottom

dollar that genetics underpins susceptibility to almost all diseases, including predispositions to infectious diseases. Novel genetic mutations are the cause of many sporadic, idiopathic conditions, including the maladies that affect the majority of the cat population, the non-pedigreed cat.

The trend for genetic testing and whole-genome sequencing will develop significantly as the standard-of-care for feline patients continues to improve, and cats will continue to grow in popularity. In the coming years,



It's becoming clear that 'simple' genetic traits, such as polycystic kidney disease, are just the tip of the iceberg. Complex variants that confer health risks and susceptibilities likely account for the majority of the variation in the feline genome. Courtesy of Steven DiBartola

veterinarians will be performing whole-genome screens of some kind as a routine component of a diagnostic investigation. Whether for tumors or other diseases, the DNA results will be what routinely directs future therapies.

Via the internet, anybody can just 'Google it' and question authority as if they are an expert in the field (the know-it-all client!). And, we all know the internet was made for cats – they are the internet stars! Indeed, everything you need to know about genetics, you can learn from your cat; thus, cat owners tend to be fairly savvy when it comes to inheritance patterns. For the veterinarian to be perceived as an expert in the eyes of the client, they must have a solid genetics foundation. Resources are available for refresher courses.² Feline practitioners should accept an 'educated' public and must be able to explain clearly, in a 'non-scientific' manner, how genetic methods can identify and control inherited diseases, as well as produce desirable features and prevent undesirable features.

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Knowledge of genetics is power. Cats can be bred in a manner to prevent illnesses, eliminating problems before they exist. Genetics can be used to eradicate a disease, never to be seen again (until a new mutation occurs). However, the veterinarian may not have the requisite skill set to 'do it by themselves'. Fortunately, feline genomics is a science where robust international collaborations based on mutual trust and respect represent the cornerstone of obtaining successful outcomes for our feline patients. In genomics, working together has solved the genetic basis for familial hypokalemia in the Burmese cat and a variety of other conditions, albeit getting all the players on the same page is rather like herding cats. The power of genomics is contingent upon finding and sampling sufficient affected, carrier and normal cats of whatever disease you are working on, breed-related or not. Without doubt, the veterinarian has a key role in helping feline genomics leap forward into the future.

It's a terrific time to develop a better understanding of modern genomic approaches to feline health, and to be part of cutting-edge approaches to unravelling important feline diseases. As discussed in a clinical review on pages 203–219 of this issue – the first of a handful of *JFMS* reviews devoted to feline genetics in the coming months – over 70 different genetic variants

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have been identified in cats that confer coat colors, fur types, morphological attributes, blood type and diseases. Hundreds of thousands of humans have had their whole genome sequenced to improve their own health or to help identify health-related DNA variants in their children. Let's work together to bring our beloved cats to the same state-of-the-art healthcare!

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Resources

- 1 <http://felinegenetics.missouri.edu/ninety-nine-lives>
- 2 Nicholas FW. Introduction to veterinary genetics. 3rd ed. Oxford: Wiley-Blackwell, 2010.

