

## Moos your daddy?

Though it is highly unlikely that a dog would ever be sued for child support, genetic testing for parentage is becoming altogether common in the canine population.

“It’s like the human model of paternity testing, but for dogs,” says Randall Smith, account manager of the veterinary division of DNA Diagnostics Center in Fairfield, Ohio. “It’s very important to breeders that they keep their pedigrees intact.”

There are, in fact, many types of genetic tests for many types of animals — such as ones to identify the “speed gene” in horses, the milk-producing potential of cows and the fertility of pigs. Then there are tests, similar to those for humans, to detect the presence of heritable genetic diseases.

Research has shown that “routine genotyping of heifer calves or yearling heifers can be a cost-effective strategy for enhancing the genetic level of replacement females on commercial dairy farms” (*J Dairy Sci* 2012;95:2215-25). For domestic pets, such as cats, DNA testing is considered a “rapidly growing asset for veterinary medicine. Approximately 33 genes contain 50 mutations that cause feline health problems or alterations in the cat’s appearance” (*Top Companion Anim Med* 2010;25:203-12).

Emerging genetic testing technologies are becoming increasingly popular among animal breeders, in particular, who hope to weed out disease and make better matches for mating. This may also help the rest of society by producing healthier pets, or food that is lower in cost and higher in quality.

“As people become more aware of the benefits of DNA testing, they are realizing these are useful tools,” Smith says.

The DNA Diagnostics Center began offering genetic testing for animals in 2003. It offers paternity tests for alpacas and tests to determine the gender of birds, which can be impossible to tell from sight for many species.



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Mostly, though, the centre performs canine genetic tests — not only for parentage, but also to determine the coat colour of offspring and, more importantly, to identify carriers of heritable genetic conditions.

“These are tools that help breeders manage the matings to avoid those carrier-to-carrier matings,” says Smith, adding that diseases are typically specific to particular breeds. “As soon as you get to a mixed-breed situation, then the tests no longer apply.”

Growing interest in genetic testing among breeders should come as no surprise, as it takes the mystery out of choosing which animals to breed, theoretically making the process more efficient and profitable. The benefits of healthier livestock, requiring fewer drugs or other medical interventions to fight off disease and parasites, would hopefully be passed onto consumers.

“It is rapidly expanding because of its potential. There has always been a

large interest and money spent on predicting the genetic value of animals,” says Imke Tammen, a senior lecturer in animal biotechnology for the Faculty of Veterinary Science at the Camden campus of the University of Sydney in Australia. “It will hopefully produce cheaper, better food.”

Still, there are ethical questions to consider when examining the DNA of animals, just as there are in human genetic testing. They include equity of access (tests for some species are more expensive than similar tests for other species), who should give consent (owner, breeder or purchaser of semen/embryos) and if the tests are as predictive as the companies that sell them claim, Tammen and a colleague indicated in a paper ([www.aaabg.org/proceedings18/files/tammen652.pdf](http://www.aaabg.org/proceedings18/files/tammen652.pdf)).

“The severity of the ethical dilemmas appear to be greater in humans but the issues are possibly even more complex in animal testing, especially if we

consider the debate about the moral status of animals,” the paper concludes. “The recent developments in DNA testing for multifactorial diseases and traits as well as testing for race or breed affiliation for both animals and humans have highlighted concerns about direct-to-consumer marketing, overselling as well as premature commercialization. In addition to the ethical concerns highlighted above, we need to be aware of the great risk that consumer confidence in DNA technologies in general can be lost easily if these new predictive tests don’t deliver.”

Though it may appear on the surface that culling weaklings from the breeding process provides only benefits to both breeders and consumers, there are nevertheless ethical matters to consider, says Tammen. “What types of breeding choices are we making? Are we breeding to produce more animals or to breed healthier animals or ones better adapted to their environment? These are the ethical questions.” — Roger Collier, *CMAJ*

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Editor’s note: Twelfth of a multipart series on genetic testing.

Part 1: **Separating hype from reality in the era of the affordable genome**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4143](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4143)).

Part 2: **Popping the genetics bubble**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4142](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4142)).

Part 3: **Who should hold the keys to your DNA?**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4141](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4141)).

Part 4: **A race-based detour to personalized medicine**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4133](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4133)).

Part 5: **Race and genetics in the doctor’s office**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4134](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4134)).

Part 6: **Predisposed to risk but not change**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4157](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4157)).

Part 7: **Unhealthy behaviours influenced by genes and environment**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4162](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4162)).

Part 8: **Young women with breast cancer genes face tough choices**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4168](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4168)).

Part 9: **The downside of genetic screening**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4169](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4169)).

Part 10: **Surge in Down syndrome prenatal testing anticipated**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4170](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4170)).

Part 11: **Screening embryos made lead to stigma**  
([www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4177](http://www.cmaj.ca/lookup/doi/10.1503/cmaj.109-4177)).