STUDENT *Scientist*

Kristyna Musil's summer job in 2008 was anything but typical. In four months, the second-year veterinary student investigated feline intestinal bacteria, became a savvy user of intricate molecular techniques and attended an international symposium in Michigan.

All of these experiences were part of Musil's role as a summer research student at the Western College of Veterinary Medicine. Each year, WCVM's successful undergraduate summer research program gives more than two dozen veterinary students the opportunity to explore biomedical research alongside their mentors. In 2008, Musil and six other students were selected as Merck-Merial Veterinary Scholars — a prestigious program in which WCVM has participated since 2005.

This wasn't Musil's first foray into a microbiology lab. After receiving her Bachelor of Science degree at the University of Manitoba in 2007, the Winnipeg resident worked on an antimicrobial study with the support of an undergraduate student research award from NSERC (Natural Sciences and Engineering Research Council of Canada).

When Musil joined Dr. Janet Hill's research team in May 2008, her goal was to study the extent of animal-to-animal variation in the microbial populations found in feline fecal samples. It's the next phase in developing an inventory of the many microorganisms that live in cats' intestines — work that will eventually lead to better therapies for intestinal health issues in cats.

Q. Can you describe your project's steps?

First, I picked 10 bacterial species to target for my assays from the pooled sample libraries developed by Dr. Desai (see "Micro Kitty" on page 2). I chose species that occurred at high or low frequency, and those with differential frequencies between the indoor and outdoor groups of cats. For each target, I designed primer sets within the *cpn60* gene using primer design software and a nucleotide database to verify primer specificity.

I then developed and validated quantitative real-time PCR (polymerase chain reaction) assays for each target. I applied the assays to the fecal DNA extractions of each cat, as well as the pooled fecal DNA samples from which the libraries of indoor and outdoor cats were generated. This allowed us to determine the actual number of each of the target species in each individual sample.

Q. What were your findings?

We found substantial variation in target abundance among individual cats, although most of the targets were detected in all cat fecal samples. Due to this variation, the pooled samples didn't reflect all of the individual cats making up the pool. Unfortunately, we can't draw any conclusions about the differences between outdoor and indoor cats in this study because there were too many potential confounding variables (such as the subjects' age, diet and environment, and their contact with other cats).

Q. How do your results tie in with overall research goals?

It's important to understand the variation in intestinal microbiota between individual cats because this will impact how further research is conducted. Pooled samples are easier and more economical to work with, but they're only reflective of the individual with the highest target abundance rather than all of the individuals comprising the pool. Hopefully, the results of this study will provide a foundation for future work investigating the role of these dynamic microbial communities.

Q. What new skills did you learn?

I learned about quantitative real-time PCR and its applications, and I developed my primer picking skills by using new primer design software. I also gained valuable experience in developing PCR protocols that would yield the desired product.

Q. What's the most interesting aspect of this project?

Intestinal microbiota play a key role in animal health, but we really know very little about these complex microbial communities. Although we know they're essential for the animal's nutritional processes and are linked to disorders like inflammatory bowel disease, we still lack a good understanding of how these processes are occurring.

Because new technologies like quantitative real-time PCR allow researchers to study bacteria without growing them in culture, even the most fastidious species can now be the subjects of investigation. As we learn more about how bacterial communities interact with each other and their animal hosts, we will gain a much better understanding of animal health and disease, and the effects of antibiotics and probiotics on these interactions. V

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