Researchers discover new TB pathogen

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Working with some of her students, Kathleen Alexander (center), associate professor of wildlife at Virginia Tech, samples and conducts a health examination of a banded mongoose in her study area in Botswana. Credit: Photo by Matt Eich

Kathleen Alexander, associate professor of wildlife in Virginia Tech's College of Natural Resources and Environment, has discovered a novel tuberculosis (TB) species in the *Mycobacterium tuberculosis* complex, a group of pathogens that have adapted by using mammals as hosts. It has been nearly two decades since a new organism was identified in this group; the majority were discovered in the early and mid 20th century.

Tuberculosis is presently the leading cause of death from infectious disease, infecting more than a third of the world's population.

Alexander discovered that banded mongoose — a species common in central and eastern Africa — that were living closely with humans in

northern Botswana were dying from a mysterious, tuberculosis-like disease. She and colleagues have now identified the pathogen as *M. mungi* sp. nov., a previously unidentified bacteria species from the *Mycobacterium* tuberculosis complex.

A pathogen is any living agent causing disease, including bacteria, viruses, fungi, yeast, and certain insect larval stages.

"This pathogen behaves very differently from the other tuberculosis infections in the complex and offers us a great opportunity to learn what drives tuberculosis evolution and ecology, providing possible insight into the control of this important group of pathogens," Alexander pointed out.

Tuberculosis normally manifests as a respiratory disease and is spread through breathing the bacteria into the lungs, but *M. mungi* behaves in a completely different way. The infection appears to be associated with environmental exposure and movement of the pathogen into the banded mongoose host through the animal's nose, possibly through abrasions on the surface of the nose that might result from feeding activity.

Unlike other species of tuberculosis, which typically present as a chronic disease, *M. mungi* usually kills infected banded mongoose within two to three months after symptoms develop, with outbreaks occurring in a largely seasonal pattern.

M. mungi threatens the survival of smaller social groups or troops of banded mongoose in the study area. The source of infection and the full host range of this pathogen are areas of active research at Alexander's long-term study site in Botswana.

"Banded mongoose are able to live closely with people in disturbed environments as well as with other wildlife species in pristine

environments," Alexander noted. "Since the majority of pathogens emerge in wildlife species, this study system offers a critical opportunity for us to begin to understand how our modifications to the environment and interactions with wildlife influence how new diseases may emerge."

The article about the emergence of *M. mungi*, "Novel *Mycobacterium tuberculosis* Complex Pathogen, *M. mungi*," by Alexander and Pete N. Laver, of Virginia Tech and the Centre for Conservation of African Resources: Animals, Communities and Land Use, Kasane, Botswana; Anita L. Michel of the ARC-Onderstepoort Veterinary Institute, Pretoria, South Africa; Mark Williams of University of Pretoria; and Paul D. van Helden, Robin M. Warren, and Nicolaas C. Gey van Pittius of Stellenbosch University, Tygerberg, South Africa, has been published in the August 2010 issue of the journal *Emerging Infectious Diseases* (http://www.cdc.gov/eid/content/16/8/1296.htm). Alexander plans to continue investigating this new pathogen species, as there is still much to learn about its ecology, transmission dynamics, and potential threats to human and wildlife health.

Currently, Alexander and her student research associates are intensively studying the behavior and ecology of banded mongoose and this new tuberculosis pathogen across both urban and protected area environments in her study site in Botswana. In addition, Alexander and her colleagues from Stellenbosch University in South Africa are studying the pathogen's molecular characteristics and using molecular tools to identify transmission dynamics. She is also evaluating samples from humans, other animals, and the environment in the study area as she searches for the pathogen's source.

"This project is like a great mystery novel because there is so much we don't know yet, but we'll find out," Alexander said.

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