

Research prevents zoonotic feline tularemia by finding influential geospatial factors

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Kansas State University veterinarians perform a feline exam. A researcher from the university is helping to prevent the spread of feline tularemia, a zoonotic disease that can also affect humans. Credit: Kansas State University

A Kansas State University epidemiologist is helping cats, pet owners and soldiers stay healthy by studying feline tularemia and the factors that influence its prevalence.

Ram Raghavan, assistant professor of diagnostic medicine and

pathobiology, and collaborative researchers have found that a certain combination of climate, physical environment and socio-ecologic conditions are behind [tularemia](#) infections among cats in the region. More than 50 percent of all tularemia cases in the U.S. occur in Kansas, Missouri, Oklahoma and Arkansas, Raghavan said.

Francisella tularensis, a bacterium that causes tularemia, commonly circulates among ticks, rabbits and rodents in the wild, but also frequently infects domestic cats. Tularemia is a zoonotic disease that can spread to humans through ticks or insect bites, eating undercooked rabbit meat, close contact with infected animals or even through airborne means. If left untreated, it can cause death in humans and animals, Raghavan said.

While it is not known exactly how many human tularemia cases are caused by exposure to infected cats, it is possible for cats to transmit the disease to owners through bites and scratches. Cats also can be reliable sentinels for recognizing disease activity in the environment. If cats hunt outdoors or come into contact with an infected rabbit or animal, they can bring tularemia back to their owners.

Raghavan's research so far has found that tularemia is more likely to appear:

- In newly urbanized areas.
- In residential locations surrounded by grassland.
- In high-humidity environments. Raghavan found that locations where tularemia was confirmed had high-humidity conditions about eight weeks before the disease appeared.

For the research, Raghavan is partnering with the university's geography department and the Public Health Department of Fort Riley Medical Activity. Raghavan maps tularemia cases confirmed by the Kansas State

Veterinary Diagnostic Laboratory and then collaborates with John Harrington Jr. and Doug Goodin—both professors of geography—to compile geospatial data for tularemia locations. By bringing in layers of data the researchers are determining how different influential factors—such as climate, land cover, landscape and pet owners' economic conditions—can lead to feline tularemia.

"Taking a multidisciplinary and computational approach helps us quickly understand the disease and make new discoveries," Raghavan said. "We use diagnostic information collected over time at the Kansas State Veterinary Diagnostic Laboratory and a wealth of extremely useful information from NASA and other agencies. We can then put all these data in a framework where it is useful for public health and animal health."

While tularemia is more common in young children and men, people also can get the disease when mowing lawns in a contaminated area, Raghavan said. Both human and feline tularemia cases peak through late spring and summer—when the weather is warmer, more ticks are present and more people are outside. Tularemia cases decrease at summer's end.

"Climate plays such a huge role in zoonotic diseases," Raghavan said. "With all the talk about climate change, we need to know if there are any significant climate effects that are causing tularemia cases to increase."

Tularemia also poses concerns for the military and soldiers during training exercises, whether they are training in U.S. bases or bases around the world. During training, soldiers are actively engaged in the environment and that increases the risk of tularemia infection.

"They could be crawling on the ground and may come in contact with a dead animal or rabbit that was infected with tularemia," Raghavan said. "The soldiers also can be bitten by ticks. All it takes is a few bacteria to

cause infection."

Because of the low infection dose of organisms, it is even more important to understand tularemia because of its potential as a bioterrorism tool, Raghavan said.

"If a little of the bacteria was present in the form of an aerosol, it could be released in a crowded area and potentially infect a lot of people very quickly," Raghavan said. "Because it is such a rare disease, not everyone is prepared for it, even though the treatments are very simple. Untreated infections can cause death."

Symptoms of tularemia in humans may include fever, swelling of lymph nodes, skin ulcers near tick bites, or cough, chest pain and difficulty breathing in more serious cases. Clinical signs in cats include lethargy, anorexia and fever. People should contact their doctor or their veterinarian if they observe tularemia symptoms, Raghavan said.

The researchers recently published their work in the journal of *Vector Borne and Zoonotic Diseases*.

Provided by Kansas State University

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