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Scientists Find Dog Ticks Carrying Deadly Rocky Mountain Spotted Fever Twice as Likely to Choose Humans over Canines When Temperatures Rise

New study presented at TropMed20 shows how climate change could expand and intensify the risk of disease that kills one in five if not treated early

Arlington, Va. (November 16, 2020) — A variety of ticks that carry the bacteria causing the deadly disease Rocky Mountain spotted fever (RMSF) are more than twice as likely to shift their feeding preference from dogs to humans when temperatures rise, a sign that climate change could expand and intensify human disease risks, according to a new study presented today at the Annual Meeting of the American Society of Tropical Medicine and Hygiene (ASTMH).

“Our work indicates that when the weather gets hot, we should be much more vigilant for infections of RMSF in humans,” said Laura Backus, MPH, DVM, who led the study at the University of California, Davis School of Veterinary Medicine (UC-Davis). “We found that when temperatures rose from about 74 to 100 degrees Fahrenheit, brown dog ticks that carry the disease were 2.5 times more likely to prefer humans over dogs.”

Cases of RMSF and related diseases, collectively known as spotted fever rickettsiosis, have [risen dramatically](#) over the last 20 years. The disease is treatable with antibiotics if detected in the first week of infection, but once an infection takes hold, the fatality rate for RMSF victims can exceed 20%. Complications can include damaged blood vessels; inflammation of the heart, lungs or brain; and kidney failure. Over the last 10 years, public health authorities have been particularly alarmed by a rash of deadly RMSF outbreaks among indigenous communities in [Arizona and northern Mexico](#).

Backus said there have been indications from earlier work that brown dog ticks, which are found throughout the continental United States, may be more aggressive toward humans in hot weather. And scientists warn that climate change is [greatly expanding areas](#) of the country experiencing multiple days when temperatures top 100 degrees Fahrenheit, or about 38 degrees Celsius. Backus and her colleagues at UC-Davis wanted to gain more definitive insights into how rising temperatures might elevate the risk of RMSF infections.

For their experiment, they constructed two large wooden boxes measuring about 3 feet tall and 2 feet wide, which were then connected to each other by a clear plastic tube. They conducted a series of tests that involved putting a human in one box, a dog in the other and ticks in the clear plastic tube between them. The researchers then observed, over 20-minute intervals, whether the ticks, which seek out hosts to feed on based on smell, preferred dogs or humans—first at temperatures of around 74 degrees Fahrenheit (23.3 degrees Celsius) and then at 100 degrees Fahrenheit (37.8 degrees Celsius).

Backus said that at the higher temperature, one type of brown dog tick, known as the tropical lineage tick, was especially decisive in shifting its preferences from dogs to humans. Currently, tropical lineage brown dog ticks are found across the southern regions of the United States, in places like Arizona, Florida, southern California and southern Georgia. However, Backus said that their range is expected to move northward as climate change causes average temperatures to rise.

Brown dog ticks belonging to another lineage, the temperate lineage, are found throughout the lower 48 states and may also carry RMSF. Backus said that while the temperate ticks showed only a slight increase in preference for humans over dogs in the higher temperature test, they exhibited a pronounced *decrease* in their preference for dogs. Many ticks simply shifted from clearly pro-dog to neutral—they did not move toward either subject.

“We believe that this decreased preference for dogs—combined with a slight increase in preference for humans—suggests that hot temperatures may also elevate risks of RMSF in areas where the temperate ticks are more common,” Backus said.

She added that it’s important to identify conditions that can increase infection risks—and put health officials on higher alert—because symptoms in the crucial early phase of RMSF, when it’s relatively easy to treat, can be mistaken for a number of more common ailments. They include headache, fever and muscle aches. Backus said there is also a need for better diagnostic tests since the existing test is time-consuming and may produce false negatives.

“The findings from the use of this simple but effective laboratory experiment to gauge how rising temperatures might lead to more human infections with a very dangerous tick-borne pathogen adds to the growing evidence of the increasing connection between climate change and its impact on health,” said ASTMH President Joel Breman, MD, DTPH, FASTM. “Climate change is moving so quickly that it is critical to keep pace with the many ways it may alter and intensify the risk of a wide range of infectious diseases so we are better prepared to diagnose, treat and prevent them.”

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About the American Society of Tropical Medicine and Hygiene

The American Society of Tropical Medicine and Hygiene, founded in 1903, is the largest international scientific organization of experts dedicated to reducing the worldwide burden of tropical infectious diseases and improving global health. It accomplishes this through generating and sharing scientific evidence, informing health policies and practices, fostering career development, recognizing excellence, and advocating for investment in tropical medicine/global health research. For more information, visit astmh.org.