

New study unravels mystery of why deadly tick disease appears to be surging, yet fatalities have not

October 26 2015

A mild disease spread by the aggressive Lone star tick that is now colonizing large swaths of the United States is being mistaken for Rocky Mountain spotted fever, according to a new study from scientists at the U.S. Centers for Disease Control and Prevention. The findings may indicate a key reason reports of infections with the potentially fatal pathogen appear to be surging but deaths are not, according to researchers. The study was presented today at the Annual Meeting of the American Society of Tropical Medicine and Hygiene (ASTMH) and published in the *American Journal of Tropical Medicine and Hygiene*.

The study probes a major mystery of the tick world: Why did reports of Rocky Mountain spotted fever jump from 1.7 to 14.3 cases per million between 2000 and 2012, even as the death rate dropped from as high as 10 percent of infections to less than 1 percent? Populations of the ticks known to carry Rocky Mountain spotted fever did not increase.

Researchers say part of the answer lies with the expansion of Lone star tick populations, which do not carry Rocky Mountain spotted fever but can carry a mild form of spotted fever that is apparently being confused with the more serious disease.

"We found that the expanding range of the Lone star tick tracked very closely to the reported rise in Rocky Mountain spotted fever infections," said F. Scott Dahlgren, MSPH, the lead author of the study. "You also see other signs of a milder disease at work. In many areas reporting

higher infection rates, you didn't see a rise in hospitalizations or deaths that would normally accompany a true outbreak of Rocky Mountain spotted fever."

The study revealed America's shifting landscape of tick populations and the variety of infections they can carry that are considered members of the "spotted fever group" family of tick-borne diseases. The researchers also found that in addition to the rise of the Lone star tick, another "aggressive biter of people" called the Gulf Coast tick is also expanding its range and carrying with it yet another form of spotted fever that, while not fatal, can cause serious illness.

Dahlgren said that many diagnoses of Rocky Mountain spotted fever today are mostly caused by *Rickettsia amblyommii*, a closely related bacteria that is commonly carried by Lone star ticks that causes a milder form of the illness. Over the last few decades, [human encounters with Lone star ticks](#) have spiked in the U.S. as the species took advantage of warmer winters and rising deer populations to expand from its southern base to as far north as Maine and as far west as Nebraska.

The ticks brought with them a form of spotted fever that in blood tests can look just like the severe Rocky Mountain variety. But it appears to cause either a mild fever or no symptoms at all. Meanwhile, a genuine case of Rocky Mountain spotted fever typically sparks a sudden onset of high fever and produces a rash. Patients of all ages can be cured with the antibiotic doxycycline. But if left untreated, the disease can cause bleeding in the brain and in other vital organs, which is fatal in 20 to 25 percent of untreated infections and causes severe, long-term health problems for those who survive.

In the United States, Rocky Mountain spotted fever is carried by the American dog tick, the Rocky Mountain wood tick, and the brown dog tick. CDC experts note that populations of these ticks have not been

expanding and, also, only a very small percentage of them actually carry the disease. For example, less than 1 percent of American dog ticks carry Rocky Mountain spotted fever, while up to 50 percent of Lone star ticks may be carrying the milder form of the disease.

(Lone star ticks can also carry [ehrlichiosis](#), [Southern Tick-Associated Rash Illness](#), and tularemia, which generally can cause fevers or muscle aches. However, Lone star ticks do not carry Lyme disease, which is transmitted by the commonly known blacklegged tick or deer tick.)

Further complicating the picture, Dahlgren said, is the Gulf Coast tick, which also carries a disease that can be mistaken for Rocky Mountain spotted fever. While nowhere near as numerous as the Lone star tick, the Gulf Coast tick also [appears to be taking advantage of warmer winters](#) and has recently expanded its range from the coastal areas of the Gulf of Mexico northward into Arkansas and Oklahoma and even into parts of the Carolinas and Virginia. The spotted fever it carries is not known to be fatal, Dahlgren said, but it's much worse than the spotted fever commonly found in Lone star ticks.

"It can be pretty scary and you could end up in the hospital," Dahlgren said. "So it's definitely something we want to monitor even though you're not likely going to die from it."

CDC researchers that note many of the cases of Rocky Mountain spotted fever reported on the Gulf Coast had relatively high hospitalization rates but low fatality rates, which they believe is more consistent with the strain of spotted fever carried by the Gulf Coast tick. Like Rocky Mountain spotted fever, it responds well to treatment with doxycycline.

Dahlgren said one problem with having such a wide range of spotted fever diseases circulating around the country is that it can be harder to identify a true outbreak of the Rocky Mountain type.

"We're particularly worried that if you have this big increase in the milder form of spotted fever it will be harder to detect and respond to an outbreak or cluster of actual Rocky Mountain spotted fever," Dahlgren said. "And if you don't start treating Rocky Mountain spotted fever within five days, your chances of dying increase significantly."

The CDC researchers cautioned that the expansion of the Lone star and Gulf Coast ticks does not account for the entire rise in reported incidence of Rocky Mountain spotted fever in the United States. They note that there are counties, largely in the Western United States, with no evidence of Lone star or Gulf Coast ticks that are reporting increases in Rocky Mountain spotted fever infections. And the death rate from the infections reported in these areas has stayed at around 10 percent and has not dropped to below 1 percent like it did in places with high infestations of Lone star ticks.

But Dahlgren and his colleagues believe that what is happening in these states may not be an actual increase in infections. Rather, they found evidence that at least some of the rise in reports of Rocky Mountain spotted fever is produced by a greater awareness of tick-borne diseases that is prompting better reporting by physicians and county health authorities.

"The deceptively good news of this study is that the type of tick-borne illness that is spreading is less serious than true Rocky Mountain spotted fever. But the take home messages are that the range of disease-spreading ticks is expanding, and that these bugs—including insects like ticks and microorganisms like bacteria, viruses and parasites—are constantly evolving to adapt, and we need to be constantly vigilant to stay on top of them," said Christopher V. Plowe, president of the American Society of Tropical Medicine and Hygiene.

Provided by American Society of Tropical Medicine and Hygiene

Citation: New study unravels mystery of why deadly tick disease appears to be surging, yet fatalities have not (2015, October 26) retrieved 24 April 2024 from

<https://medicalxpress.com/news/2015-10-unravels-mystery-deadly-disease-surging.html>

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