

Researchers show that in some cases, what looks like Lyme could be completely different illness transmitted by same bug

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The research raises the question of whether patients with atypical Lyme disease—those who have symptoms but whose blood doesn't test positive for Lyme—may actually be infected with *B. miyamotoi*, the newly identified bacteria. Credit: Kelvin Ma

Under the microscope, Sam Telford surveyed the tiny, spiral bacteria floating in spinal fluid taken from an 80-year-old woman. They looked very similar to the spirochete bacteria that can cause Lyme disease. But

in fact, he had discovered yet another public health threat—a brand new disease that people can get from the same ticks that transmit the Lyme bacteria.

"We've known that this bacteria existed in the Northeast in deer ticks, but there was little data linking it to human disease" until now, says Telford, an expert on [tick-borne diseases](#) and a professor in the Department of [Infectious Diseases](#) and Global Health at the Cummings School of Veterinary Medicine. "We just needed the right patient to confirm the presence of the disease."

That patient was the elderly woman, who lived on a farm in New Jersey. Over four months, she had experienced progressive [mental decline](#), becoming increasingly confused. Her gait grew wobbly, and she didn't have much of an appetite. Her immune system was compromised from a previous bout with cancer, so her doctors drew spinal fluid in the hopes of finding out what was going on.

When technicians at a commercial [diagnostic laboratory](#) saw the mysterious spiral bacteria, they sent the sample for further testing to Telford, whose laboratory serves as a reference center for unusual [zoonotic infections](#), those that pass between animals and humans.

Telford and Heidi Goethert, J93, a [microbiologist](#) at the Cummings School, sequenced the spirochete DNA, and identified it as *Borrelia miyamotoi*, which was first found in ticks in Japan in 1995 and is closely related to the bacteria that causes [Lyme disease](#). Previous human cases of *B. miyamotoi* infections were found in Russia in 2011.



Sam Telford walks through the grounds of the Cummings School with a cloth used to collect ticks. Credit: Kelvin Ma

The Tufts scientists reported the first U.S. case of human *B. miyamotoi* infection in the [New England Journal of Medicine](#) in January. (The woman was treated with antibiotics and has since recovered.)

The *B. miyamotoi* bacteria may be an under-recognized source of human disease, especially in regions such as the northeastern United States, where Lyme disease is prevalent, say Telford and his coauthors.

There's controversy in the scientific and medical communities about whether a person can test negative for Lyme and still have Lyme, says Telford. This latest research raises the question of whether patients with atypical Lyme disease—those who have symptoms but whose blood doesn't test positive for Lyme—may actually be infected with *B. miyamotoi*, he says. Both are treated with the same course of antibiotics.

While an estimated 12 to 18 percent of coastal New Englanders have been infected with the Lyme bacteria, called *Borrelia burgdorferi*, only between 1 and 3 percent of people have likely been infected with its

lesser-known cousin, *B. miyamotoi*, researchers at Yale reported in a correspondence that accompanied the Tufts study in NEJM. (The Yale team is led by Peter J. Krause, M71, and also includes Timothy J. Lepore, M70.)

Not all deer ticks carry *B. miyamotoi*, just like they don't all carry the Lyme-causing bacteria. Previous surveys of ticks suggest the new bacterium appears to be much less common—roughly 10 percent as prevalent—than the one that causes Lyme, according to Telford. While to date there has only been one confirmed case of human infection in the U.S., researchers have known for some time that the ticks carry these [bacteria](#). Telford says they suspected that people were being infected with it, but [proof was lacking]. They were waiting for the right patient to come along.

This new disease, which has yet to be named, is the fifth known human infection to come from [deer ticks](#) in the Northeast, after Lyme, babesiosis, ehrlichiosis and deer tick virus.

Ticks are notorious transmitters of infectious disease around the globe. Their indiscriminate dining habits (they don't seem to care what animals they feed on) and the relatively large amount of blood they consume (200 times their own body weight) make ticks great at picking up pathogens and spreading them.

"Lyme disease alone is enough of an argument to take action to reduce risks, let alone four other infections. In some New England communities, as many as a third of residents have been exposed to at least one tick borne infection," says Telford, who suggests that public education about tick-borne diseases and reducing deer herds, while controversial, may be a good places to start.

More information: www.nejm.org/doi/full/10.1056/...

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