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## More than just Lyme

PSC professor studies types of diseases carried by ticks

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Black-legged ticks are in the Adirondacks, and the illnesses they can carry go beyond the well-known Lyme disease.

The small arachnids, also called deer ticks, carry a variety of diseases including Lyme disease, anaplasmosis, borrelia miyamotoi and babesiosis. Recent research indicates they might also carry the rare Powassan virus, which can attack the central nervous system.

Paul Smith's College molecular biology Professor Lee Ann Sporn and her students are among those assisting the state Department of Health in determining tick populations here. Sporn researched areas near the college, the edge of the Bloomingdale Bog trail and sites in the town of Black Brook.

### Article Photos



A female blacklegged tick

One of the few places she was able to collect ticks was the base of Whiteface Mountain, which was surprising because it's a fairly high elevation.

"About 25 percent of the ticks there were positive for Lyme, and that's a significant positive," Sporn said. "The challenge is, tick abundance is so low that it's difficult to find them."

In other areas where tick density is high, like the Albany Pine Bush and the Champlain Valley, tick collection is easy using the standard method of dragging a large white sheet through the understory.

### Fact Box

By the #s

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More than 5,500 new Lyme disease cases have been reported each year in New York state since 1986.

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Yearly average cases of other tick-borne illnesses, since 2005:

255 of babesiosis

268 of anaplasmosis

15 of Rocky Mountain spotted fever

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19 total cases of Powassan encephalitis since 2005

That method wasn't working here, so Sporn incorporated other indicators, like reports of Lyme disease from local veterinarians. She learned between one and five and one and 10 dogs in Franklin County test positive for Lyme disease annually.

"Dogs are great sentinels, so we initiated a study where we're monitoring the dog populations here," Sporn said. "Veterinarians often test them annually for Lyme. Since some dogs don't get sick, it's kind of nice that some vet practices do that."

Sporn also began trapping small mammals like mice and voles and testing tissue samples from them for four pathogens that can cause diseases in humans: Lyme disease, babesiosis, anaplasmosis and the Powassan virus.

They didn't test positive for babesiosis or anaplasmosis, but 5 to 10 percent of them carried Lyme disease. Sporn also found Powassan virus antibodies.

Powassan virus is named after the town in Ontario, Canada, where it was first discovered in 1958. It causes Powassan encephalitis, which infects the central nervous system and causes inflammation of the brain, and meningitis, the inflammation of the membranes that surround the brain and spinal cord.

The virus is transmitted within 15 minutes of exposure to the tick, whereas it can take 24 hours for Lyme disease to be transmitted.

Powassan encephalitis has a 10 to 15 percent mortality rate, according to the U.S. Geological Survey website. Antibiotics can't be used to treat the virus, and people who recover are typically left with permanent neurological damage.

Until now, the Powassan virus was only thought to be carried by woodchuck ticks, which rarely bite humans.

"I don't mean to be sensational about it, but the virus seems to have changed a bit," Sporn said. "There's a new strain (of Powassan virus), lineage 2, that can be spread by the same tick as Lyme. It's called deer tick virus. If deer ticks are on the increase here, then we have to watch for deer tick virus as well. So now all of our ticks and small mammals are tested for deer tick virus, and yes, we found some positives."

None of the ticks the researchers found tested positive for Powassan virus, though.

"This shouldn't be a huge cause for alarm," Sporn said. "They looked at deer tissue down in the Hudson Valley, and about 88 percent of deer tests have shown exposure to this Powassan virus. So it's probably not a cause for concern right now, but we're watching it."

Melissa Prusinski, a research scientist and laboratory supervisor with the DOH's Bureau of Communicable Disease Control, said the first cases of Powassan virus in New York state were documented in 1975.

"Powassan is one of the least common causes of arboviral encephalitis in the United States and Canada, ranking behind the mosquito-borne illnesses LaCrosse encephalitis, St. Louis encephalitis, and eastern and western equine encephalitis," Prusinski said. "That being said, certain regions of New York have seen a recent increase in Powassan encephalitis, from less than one case per year to three or more."

By comparison, more than 5,500 cases of Lyme disease are reported in New York annually.

Prusinski said the recent increase in Powassan encephalitis is likely the result of the emergence of the deer tick virus. Likewise, she said there is also a direct correlation between black-legged tick

abundance and incidences of Lyme disease.

The range of black-legged ticks has significantly expanded beyond its historically endemic regions of the Hudson Valley and Capitol Region.

Prusinski described an expanding front of ticks that now stretches from the St. Lawrence River plateau southward through central New York to the Pennsylvania border, as well as the Champlain Valley and southern Adirondacks.

Ticks are more common along routes frequented by their hosts, but Prusinski said it's unlikely they are being brought into the Adirondacks on the backs of visiting dogs.

"While pets may play a small role in moving ticks from one area to another, factors such as changing forest structure, climate change, changes in land use and development, fluctuations in small mammal abundance, and increasing deer populations have a much more significant impact on tick establishment and population density," Prusinski said. "These factors are all dynamic, so no region of New York should be considered free of deer ticks, and residents should take precautions to prevent exposure to ticks and to reduce tick-borne disease risk whenever they spend time outdoors."

Brian Leydet, a biologist with the Trudeau Institute, agreed with that assessment. He's using genetics to examine tick populations in the region.

Leydet explained that DNA gets replicated when cells divide, but it doesn't always replicate perfectly.

"If you were to write an 'A' a million times, maybe one time you'd write the letter 'B', and that's what this does," Leydet said. "We know this type of mutation can occur every so many generations. So every once in a while you have this base pair change, and if the change is not detrimental or doesn't have any effect, it just stays there."

If the mutation doesn't have a negative effect on the ticks, they could mate and pass the mutation on.

By modeling the base pair differences, Leydet can predict what scientists would expect to find in 100 years if the population were increasing or decreasing. In the Adirondacks, he said the data seem to suggest that populations are expanding.

"It's kind of a second way to look at it besides going out and dragging for ticks for 10 years to monitor tick numbers," Leydet said.

Leydet said he also hopes to use genetics to determine where Adirondack ticks are coming from.

"You can have an introduction of ticks to a new area, but you could also have ticks that have been here for a while, and are just having the right conditions for expansion," Leydet said. "While it's not going to solve Lyme disease, we have to understand what's going on in the vector, or we won't understand what's going on in nature or where human health is concerned. If you don't have all of the pieces of the puzzle, you're never going to see the whole picture."

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