

Tick-Borne Powassan Virus Can Be Deadly

Tick-borne Powassan virus has been gaining attention after sending former North Carolina Senator Kay Hagan into a 43-day coma this past year.



After being hospitalized for eight months, Senator Hagan was released and was said to be recovering.

Unfortunately, others were not so lucky. Powassan has reportedly caused at least three deaths in late 2016.

While Powassan virus (POWV) was discovered nearly 60 years ago, many people are learning of it for the first time. Of special concern: it can be transmitted in as little as 15 minutes by the same tick that carries Lyme disease.

Because POWV has been considered so rare, with only 75 cases reported in the United States over the past 10 years, very little has been known about it—until now.

A [recent study](#) conducted by the Marshfield Clinic in Wisconsin demonstrates that POWV may be much more prevalent than previously thought. Of 95 patients tested for suspected tick-borne disease, 66% showed evidence of current or prior Lyme infection.

Of those patients who tested positive for Lyme disease, 17% had serologic evidence of acute POWV infection. Considering there are an estimated 300,000 cases of Lyme disease per year, POWV may affect more patients than we know.



Durland Fish, PhD, a professor of epidemiology at Yale School of Medicine who specializes in vector-borne diseases, [warned of POWV in 2015](#). He says one of the biggest concerns is that POWV jumped to the deer tick within the last 30 years and “cases are being reported in areas where they have never occurred before.”

Dr. Fish goes on to say, “As more ticks become infected with Powassan virus and more people become exposed to them, Powassan could become epidemic like Lyme disease. Because it can be a serious disease causing fatalities, and there is no treatment for it, Powassan has the potential to become a greater public health threat than Lyme disease.”

After the 2017 death of two men in [Cape Cod](#), many people are learning for the first time that ticks can carry viruses too, not just bacteria like Lyme disease. And that such tick-borne viruses can pose a significant threat to public health.

Powassan virus (POWV) is considered an “[emerging infectious disease](#),” though it is not new. In fact, the first case was discovered in 1958 in the small town of Powassan, located in Ontario, Canada.

A Massachusetts case had a better outcome. Tucker Lane contracted Powassan in 2014 and considers himself lucky to be alive.

“[I] woke up sweating, cold, shaking... felt like I was going to puke,” he told CBS Boston. A few days later, he fell into a week-long coma. “They kind of told my parents there’s nothing more we can really do.” Eventually, however, he came out of it.

Three years later, Lane says his health is fine and he reports no lingering symptoms or damage to his brain. “I knew I got lucky in a very unlucky situation,” Lane said.

Symptoms

For those who become ill, the symptoms of POWV develop anywhere from 8-34 days after the tick bite. The initial symptoms are flu-like with a fever.



If the infection spreads to the brain, severe neurological symptoms can develop, including strong headache, mental confusion, paralysis, seizures, and unconsciousness. About 60% of patients who survive the infection are left with permanent neurological dysfunction including partial paralysis, headaches, memory impairment, and paralysis of the eye muscles. Nearly 10% of Powassan cases are fatal.

No Cure

Currently, there is no cure for POWV. Many of the patients who develop symptoms need to be hospitalized. The [treatment](#) consists of IV fluids, anti-inflammatories, and, in some cases, breathing and life support.

Powassan is a [flavivirus](#) that is related to Zika, Dengue, West Nile, and tick-borne

encephalitis virus (TBEV). These are named *Flava* (which means *yellow* in Latin) after the Yellow Fever virus, which causes yellowing of the skin. Flaviviridae are a family of viruses that can cause brain swelling.

Emerging Infectious Diseases

Powassan and many other tick-borne diseases are considered emerging because the number of cases has increased significantly over recent years.

There is some debate over whether increased geographic spread or better detection techniques have led to the increased number of reported cases. I suspect both factors play a role. (See [Ehrlichia](#), another emerging infectious diseases.)

One way to determine whether POWV is spreading is through tick studies. There seems to be great variation from year to year but studies show anywhere from 1% to 10% of ticks in endemic states test positive for POWV compared to 20%-50% for Lyme.

Two Types of Powassan in North America



There are two types of Powassan in North America. Lineage 1 POWV is associated with both woodchucks and *Ixodes cookei* ticks; or squirrels and *Ixodes marxi* ticks. Lineage 2, sometimes called deer tick virus (DTV), is associated with the white-footed mouse and *Ixodes scapularis* ticks.

Because *I. cookei* and *I. marxi* do not climb up blades of grass in wait for a suitable host (a behavior known as *questing*), they are not thought to play a major role in the transmission of POWV.

The blacklegged or “deer tick” (*Ixodes scapularis*) on the other hand, has developed multiple strategies for questing. Deer ticks are also aggressive biters, making them much more competent in transmitting diseases like POWV to humans.

Add Powassan to the Tick Toxic Soup

While many tick species are known to carry POWV, the blacklegged tick (*I. scapularis*) is the primary vector. Blacklegged ticks can carry many pathogens and can transmit more than one infection in a single bite. While we should be very concerned about POWV, the risk of contracting Lyme or Babesia is currently much greater. (See my previous post on [co-infections](#).)

No Grace Period

A tick becomes infected with POWV after feeding on a small mammal carrying the virus. When the infected tick bites a human, transmission can occur in as little as 15 minutes. Since ticks are so small and POWV transmission so rapid, very few patients with Powassan encephalitis will recall the tick bite.

If you get bitten by a tick while out hiking or playing, you could be infected with Powassan without even realizing anything has happened.

Hidden Epidemic?

Most Powassan virus infections are thought to be asymptomatic. This assumption is based, in part, on reviewing the results of human blood tests. Two studies found that 0.7% of New Yorkers and 3% of Canadians from Ontario carry antibodies to POWV—meaning they were infected at some point.

Rough math says 0.7% of New Yorkers would make 500,000 cases of POWV in that state alone, when in fact, only 16 cases were reported in New York from 2006 to 2015. This suggests that the majority of cases are asymptomatic, and that POWV is underrecognized as an infectious disease.

Unrecognized POWV may also contribute to the high number of Lyme disease patients who remain ill after treatment, because viruses do not respond to antibiotics. Some experts theorize that POWV and other viruses may also play a part in other chronic neurologic diseases, like lupus, multiple sclerosis, ALS, Parkinson's, chronic fatigue syndrome, or myalgic encephalomyelitis. But this is still under investigation.

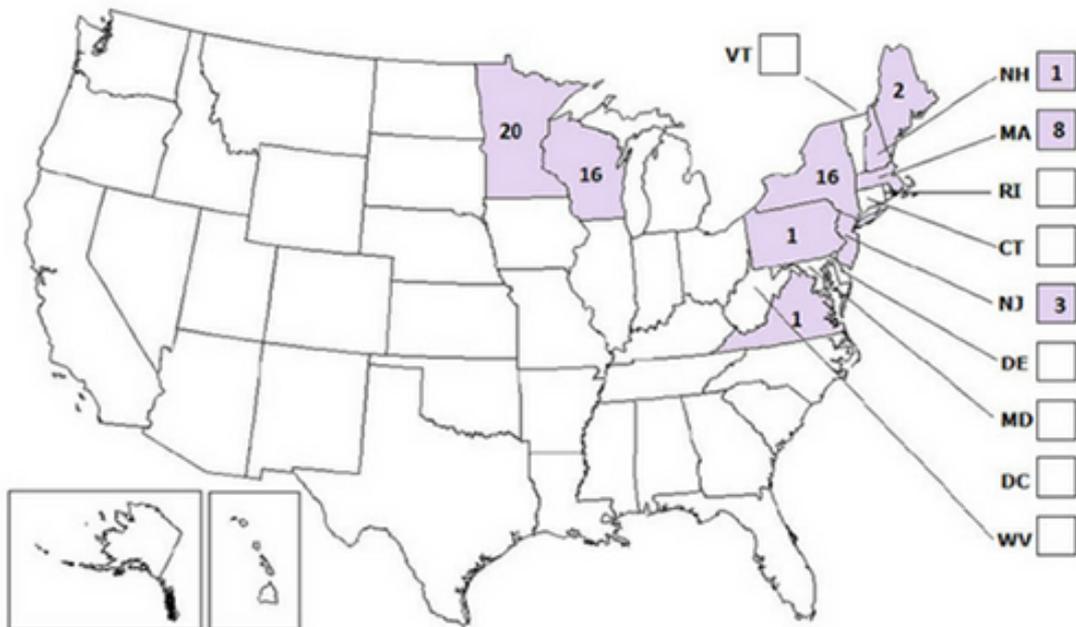
Timeline of Illness

1 to 5 week Incubation period	Early Symptoms approximately 1 week	Acute Illness weeks to months	Chronic Symptoms years
No Symptoms	Fever, headache, sore throat, nausea, drowsiness, disorientation. May include: gastrointestinal issues, muscle weakness.	Fever, vomiting, respiratory distress, difficulty with speech, paralysis, loss of consciousness. May include seizures.	Memory problems, paralysis on one side of the body, muscle weakness, muscle wasting, severe headache.

Geographic Distribution

Powassan Virus

Neuroinvasive Disease Cases



Cases reported to CDC 2006 - 2015



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The underdiagnosis of POWV contributes to the lack of understanding of the geographic distribution. From 2006 to 2015, there were only [68 cases of POWV](#) reported to the CDC with eight (12%) fatalities. (see map)

After the [sudden death](#) of a woman in Maine in 2013, that state conducted its own tick study on the Powassan virus. The researchers tested a total of 1,729 *I. scapularis* ticks from 30 different locations statewide and the results were astonishing.

The rate of infection throughout Maine ranged from a low of 0% to a high of 16% (average

7% adult, 9% nymphs). “We were kind of surprised that we found as much as we did,” said Chuck Lubelczyk, the project director.

POWV has been established along the East Coast from Virginia to Nova Scotia, throughout New York, Pennsylvania, Michigan, Wisconsin and Minnesota, broadly throughout Canada, and in rare instances has been detected in Colorado and California.

There several other tick-borne viruses found in the US, including Heartland virus, Bourbon virus and Colorado tick fever, which will be addressed separately.

As with all tick-borne diseases, prevention is key. [Click here](#) for more information about protecting yourself, your family and your pets.

LymeSci is written by Lonnie Marcum, a Licensed Physical Therapist and mother of a daughter with Lyme. Follow her on Twitter: [@LonnieRhea](#). Email her at: lmarcum@lymedisease.org.

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Editor's note: Any medical information included is based on a personal experience. For questions or concerns regarding health, please consult a doctor or medical professional.