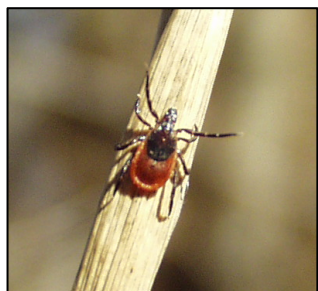


Powassan Virus and Deer Tick Virus

Most tick-borne diseases, such as Lyme, are caused by bacteria. However, with a recent case in New Jersey and discovery in Connecticut blacklegged (deer) ticks, Powassan virus (POWV) has recently come to public attention.



Approximately 75 cases of Powassan virus disease were reported in the United States over the past 12 years (103 since 1958) mostly from the Northeast and Great Lakes regions and incidence appears to be increasing. 23 human cases of illness occurred in NY from 1971 to 2016, primarily from the lower Hudson Valley area. Although some people infected with POW do not develop symptoms, it can cause encephalitis (inflammation of the brain) and meningitis (inflammation of the membranes that surround the brain and spinal cord). Other symptoms can include fever, headache, vomiting, weakness, confusion, drowsiness, lethargy, some paralysis, disorientation, loss

of coordination, speech difficulties, seizures and memory loss. Long-term neurologic problems may occur and about 10% of cases are fatal. There is no specific treatment, but people with severe POW virus illnesses often need to be hospitalized to receive respiratory support, intravenous fluids, or medications to reduce swelling in the brain.

Powassan virus was first identified in 1958 from a young boy in Powassan, Ontario who eventually died from the disease. Related to the West Nile Virus, in North America studies so far suggest POWV is a complex of viruses with two genetic 'lineages' including the initial (1958) LB strain and others found in Canada and New York State (POWV, Lineage I), and a second sometimes referred to as 'deer tick virus' (DTV, Lineage II), found in animals in the eastern and upper mid-west US and in humans. Powassan is present on Long Island where blacklegged tick is also common, but incidence appears to be extremely low. POWV and DTV are associated with several tick species but blacklegged tick (also known as deer tick, *Ixodes scapularis*) and DTV have the most immediate significance for humans in the northeastern US. In one New York survey DTV was detected in both adult- and nymph-stage questing blacklegged ticks collected from 53 pools in four lower Hudson Valley counties from 2007 to 2012 with estimated adult tick infection rates from 0.2 to 6.0% in areas where DTV was found. Five pools with infected nymphs were also found on mammalian hosts. Transmission of DTV appears to occur rapidly, within 15 minutes after ticks become attached. Humans do not develop sufficiently high concentrations of virus in their bloodstreams to infect feeding ticks, so are considered "dead-end" hosts.

White-footed mice are implicated as reservoirs for DTV; woodchucks, squirrels, and skunks may be important reservoirs for POWV, but this needs more clarification. Woodchuck tick (*I. cookei*) and 'squirrel tick' (*I. marxi*) are associated with POWV but rarely bite humans. Lone star and American dog ticks are common on Long Island, but do not appear to be carriers of POWV or DTV. More research is needed to better understand this group of viruses, their animal host associations, and how they persist in the environment.

References

- Backenson, B. et al. Current State of Tick-Borne Diseases in New York State, and Kramer, L. Powassan Virus Studies in New York. at New York State Tick-Borne Disease Research Workshop, Albany, NY March 24- 25, 2015.
- Dupuis A.P., et al. 2013. Isolation of deer tick virus (Powassan virus, lineage II) from *Ixodes scapularis* and detection of antibody in vertebrate hosts sampled in the Hudson Valley, New York State. *Parasites & Vectors*.6:185.
- Ebel, G. 2010. Update on Powassan Virus: Emergence of a North American Tick-Borne Flavivirus. *Ann. Rev. Entomol.* 2010. 55:95–110
- US Centers for Disease Control and Prevention. Powassan Virus <http://www.cdc.gov/powassan/transmission.html> Website accessed 5/12/2015