



Powassan encephalitis

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A case of meningoencephalitis caused by Powassan virus, an arthropod-borne virus (arbovirus), is reported by Bassam Gholam and colleagues¹ in this issue of *CMAJ*. In 1959 the index case of Powassan encephalitis, which was fatal in a young child, was reported,² and there have been sporadic case reports of this very rare but life-threatening illness in the ensuing years. Unfortunately, as with the original case, the patient in this report died, the immediate cause of death being a pulmonary embolism after he had improved to some degree from a severe neurologic impairment. The patient contracted the infection from a tick bite in Algonquin Provincial Park, a popular wilderness recreation area; Powassan, Ont. is very close to the northwestern boundary of the Park.

Powassan virus infection appears to be one of the least common causes of arbovirus encephalitis reported in cases from the United States and Canada, ranking behind LaCrosse, St. Louis and eastern and western equine encephalitis.³⁻⁵ However, Powassan virus and eastern equine encephalitis have the dubious distinction of having the highest case-fatality rates and are associated with a very high incidence of neurologic sequelae.^{1,5} Humans are accidental victims when they enter into areas where the virus, the arthropod vector (an ixodid tick) and the vertebrate natural hosts coexist. Among the most commonly implicated natural hosts are the woodchuck and snowshoe hare.⁵ However, other animals that humans come into contact with including coyotes, foxes, raccoons and skunks have shown serological evidence of infection.⁶ Moreover, the scope of transmission of the virus may be broadened by domestic cats and dogs, which can act as harbingers of infected ticks and thereby expose humans. Cases of arbovirus encephalitis have been reported from Ontario, Quebec and New Brunswick in Canada and from New York, Pennsylvania and Massachusetts in the United States.^{1,5} Surveillance serologic studies have been positive in up to 3% of the population in certain northern Ontario communities, suggesting that infection without encephalitis can occur in humans.⁸

The names of arboviruses (e.g., Powassan, St. Louis and LaCrosse) can be somewhat misleading because they may imply, erroneously, a somewhat restricted geographic region in which it is possible to come into contact with the virus. Although the names often indicate where the virus was originally isolated, the range of many of these viruses may be wide and include large areas of Canada and the

United States.⁵ Moreover, the frequent travel of people between the 2 countries potentially exposes us to arboviruses from both countries.^{4,9}

What can we learn from this rare case of Powassan virus encephalitis? First, it reminds us that there are reservoirs of arbovirus in Canada that can infect humans and cause devastating results if we enter their natural habitats. Second, there are no specific antiviral therapies for these infections, and prevention is paramount to controlling the morbidity and mortality associated with these illnesses. Although vaccines for certain North American arboviruses are available for restricted use in high-risk groups, there are none currently available for the prevention of Powassan virus infection.⁵ Therefore, awareness of the arthropod vector, the natural vertebrate hosts and the seasonality of potential transmission is helpful in designing preventive measures against infection.¹ Third, a thorough epidemiologic history is important for the diagnosis of most infectious diseases, especially for zoonoses, and has immediate implications for differential diagnosis and management. Moreover, when the cause of specific infectious syndromes is determined, information can be added to surveillance data. Unfortunately, with the encephalitis syndrome a specific cause may only be determined in fewer than 50% of cases.¹⁰ Fourth, in this most recent case of Powassan encephalitis, as in a previous case,¹¹ there were no clinical, radiologic or laboratory features that distinguished it from other severe forms of encephalitis, including herpes simplex encephalitis.

Most patients with severe encephalitis will be treated with intravenous acyclovir on the assumption that they have herpes simplex encephalitis. Only if the clinical course, diagnostic imaging features and laboratory tests, including polymerase chain reaction on the cerebrospinal fluid, strongly suggest otherwise will the diagnosis of herpes simplex encephalitis be excluded. Currently in Ontario the Provincial Health Laboratory performs a hemagglutination inhibition assay on acute and convalescent sera for Powassan virus antibody. Although the test will cross-react with antibodies of other flaviviruses such as dengue, St. Louis encephalitis and yellow fever, an epidemiologic history of the patient should help distinguish among them. The major drawback is that the detection of seroconversion may require a week or more, delaying diagnosis. More rapid and specific tests, such as polymerase chain reaction and enzyme-linked immunosorbent assay for the immunoglobulin M antibody, are available through national



and international reference laboratories.⁵ Therefore, if an arbovirus infection is strongly suspected the Provincial Health Laboratory should be contacted for diagnostic guidance as soon as possible.

On a more optimistic note from a therapeutic standpoint, the technical resources and expertise that have resulted in the development of many novel anti-HIV drugs could be applied to the development of antiviral agents effective against arboviruses. However, they are a diverse group of viruses, and whether the relatively small number of serious arbovirus infections in North America would justify such resources for new drug development is problematical.

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