POWASSAN VIRUS DISEASE

Disease Overview

Powassan virus (POWV) disease is a rare tick-borne illness caused by the flavivirus POWV. There are two lineages of POWV that both cause disease in people: the prototypic lineage, POWV lineage I and POWV lineage II (also called the deer tick virus).

Symptoms

The cases occur primarily in the late spring, early summer, and mid-fall when ticks are most active due to the warmer weather. The seasonal incidence depends on the activity of tick vectors.

Most people who become infected with POWV are asymptomatic or develop a mild flu-like illness; however severe neuroinvasive disease can occur.

Symptoms in the initial phase of the disease can include fever, sore throat, drowsiness, headache, and disorientation. This can progress to neuroinvasive disease, which can include fever, vomiting, respiratory distress, loss of coordination, speech difficulties, paralysis, and seizures. Case fatality of Powassan neuroinvasive disease has been reported as high as 10%, with up to 50% of survivors experiencing long-term neurologic sequelae.

Reservoir

Ixodes ticks transmit the pathogen to people during tick feeding. Blacklegged ticks (*I. scapularis*) are the main vector of POWV lineage II; groundhog ticks (*I. cookei*) and squirrel ticks (*I. marxi*) are the main vectors of POWV lineage I.

Reservoir hosts support the circulation and maintenance of the pathogen. Vertebrate reservoirs are natural hosts for ticks and once infected, remain infected life long and continue to transmit the pathogen to feeding ticks. In North America reservoir hosts for POWV are small rodents.

Mode of Transmission

Primarily vector-borne transmission via bites from infected ticks. The transmission window, or time of tick attachment and POWV transmission, may be less than 15 minutes. Ticks can attach to any part of the body but are often found in hard-to-see areas such as the groin, armpits, and scalp.

The virus is not transmitted from person to person, except in rare instances by blood transfusion.

Incubation period

1-5 weeks

Period of Communicability

No evidence of natural transmission from person to person.

Risk Factors

Increased risk for acquiring/severe illness:

- Exposure to *Ixodes* ticks

Surveillance Case Definition

Confirmed Case

Confirmatory laboratory evidence of infection with or without clinical evidence of infection.

Clinical evidence of infection:

- (at least one of the initial febrile phase symptoms: fever, sore throat, drowsiness, headache, and disorientation; OR at least one of the neuroinvasive disease symptoms: fever, vomiting, respiratory distress, loss of coordination, speech difficulties, paralysis, and seizures)

Confirmatory laboratory evidence of infection:

- Isolation of POW virus (POWV) from blood, cerebrospinal fluid (CSF), brain tissue, or any other biological fluid or tissue

OR

- Detection of POW-specific nucleic acids in blood, cerebrospinal fluid (CSF), brain tissue or any other biological fluid or tissue

OR

- Serological detection of POW-specific IgM by Enzyme immunoassay (EIA) assay *AND* observation of a significant increase in neutralizing antibody titre by Plaque-reduction neutralization tests (PRNTs) between acute and convalescent serum without evidence of other flaviviruses

OR

- POW-specific IgM seroconversion by EIA (negative to positive) between acute and convalescent serum *AND* detection of neutralizing antibodies by PRNTs ≥ 20 without evidence of other flaviviruses

OR

- Significant increase in total antibody titer by Hemagglutination Inhibition (HI) test between acute and convalescent serum *AND* detection of neutralizing antibodies by PRNTs ≥ 20 without evidence of other flaviviruses

OR

- Seroconversion of total antibody titre by HI test (negative to positive [≥ 20]) between acute and convalescent serum *AND* detection of neutralizing antibodies by PRNTs ≥ 20 without evidence of other flaviviruses

OR

- Detection of POW-specific IgM by an EIA test on CSF (serum is not included) AND observation of a neutralizing antibody titre by PRNTs ≥ 20 without evidence of other flaviviruses.

Probable Case

Supportive laboratory evidence of infection AND

- Clinical evidence of infection (at least one of the initial febrile phase symptoms: fever, sore throat, drowsiness, headache, and disorientation; OR at least one of the neuroinvasive disease symptoms: fever, vomiting, respiratory distress, loss of coordination, speech difficulties, paralysis, and seizures).

Supportive laboratory evidence of infection:

- Serologic detection of POW-specific IgM by EIA assay *AND* observation of a neutralizing antibody titre by PRNTs assay ≥ 20 on a single serum

OR

- Serological detection of POW-specific IgM by EIA without a significant increase in neutralizing antibody titre by a PRNTs test between serum collected in the acute phase and that collected in the convalescent phase

OR

- Serological detection of a single HI titre ≥ 20 *AND* detection of neutralizing antibodies by PRNTs.

Diagnosis and Laboratory Guidelines

The diagnosis is based on an assessment of exposure risk (e.g. living in or recent travel history to tick endemic areas), clinical signs and symptoms, in addition to laboratory testing.

Cross reaction with other flaviviruses can occur. Flavivirus are transmitted predominantly by arthropods (mosquitoes and ticks) and range from asymptomatic to haemorrhagic disease (e.g. dengue, yellow fever) or encephalitic disease (e.g. tick-borne encephalitis, West Nile virus, Japanese Encephalitis, Zika).

Due to serological cross-reactivity between flaviviruses, a single-sample PRNTs antibody titre must be at least four-fold greater than that for other relevant flaviviruses (e.g. tick-borne encephalitis, West Nile virus, dengue, Zika), based on geographic area of exposure, travel and/or vaccination history.

Diagnostic testing for POWV is done at the National Microbiology Laboratory (NML). PCR testing is available, but it is not recommended as a routine test; it should be considered as an alternative test for specific situations (such as for immunosuppressed individuals, who might have low titers in serological test). Public Health staff should discuss the findings with the Medical Officer of Health before initiating an investigation.

Reporting

Per Policy 2.2 Disease and Event notification to OCMOHE and Disease and Event Reporting section

- Enhanced surveillance. For all confirmed and probable cases, an enhanced surveillance form should be completed and sent to OCMOHE within 5 days of completing the interview.

- Routine surveillance (RDSS) for all confirmed cases.

Case Management

Education

Case or relevant caregiver should be informed about:

- Nature of infection, length of communicable period, mode of transmission and disease ecology
- Tick bite prevention

Investigation

Obtain travel history, outdoor activity, and tick exposure to determine if source of infection occurred within a recognized endemic focus or not.

Exclusion/Social Distancing

Not applicable.

Treatment

No targeted treatment for Powassan virus infection. Treatment is supportive care. For individuals who experience severe disease, clinical management requires consultation with a health care provider and may require hospitalization.

Immunization

Not applicable.

Contact Management

Education

Not applicable

Investigation

Contacts of cases are not at risk as there is not usually person-to-person transmission.

Exclusion/Social Distancing

Not applicable.

Prophylaxis

Not applicable. No vaccine is available to prevent POWV infections.

Outbreak Management

Activate the local outbreak plan when an outbreak is declared.