Ministry of Health

Requirements for Programs, Services and Accountability

Infectious Diseases Protocol

Appendix 1: Case Definitions and Disease-Specific Information

Disease: Powassan Virus Infection

Effective: July 2023

Ontario

Powassan Virus Infection

☐ Communicable

☐ Virulent

Health Protection and Promotion Act **(HPPA)[1]**

Ontario Regulation (O. Reg.) 135/18 (Designation of Diseases)[2]

Provincial Reporting Requirements

☒ Confirmed case

☒ Probable case

As per Requirement #3 of the "Reporting of Infectious Diseases" section of the *Infectious Diseases Protocol, 2018* (or as current), the minimum data elements to be reported for each case are specified in the following:[3]

- O. Reg. 569 (Reports) under the HPPA;[3]
- The iPHIS User Guides published by Public Health Ontario (PHO); and Bulletins and directives issued by PHO.[3,4]

Type of Surveillance

Case-by-case.

Case Definition

Confirmed Case

Laboratory confirmation of infection with or without clinically compatible signs and symptoms.

Probable Case

Supportive laboratory evidence of infection with clinically compatible signs and symptoms of infection.

Suspect Case

Not applicable.

Outbreak Case Definition

Not applicable.

Clinical Information

Clinical Evidence

Clinically compatible signs and symptoms are characterized by fever, chills, headache, nausea, vomiting, myalgia, confusion, weakness, ataxia, paresis, nuchal rigidity, and/or lymphocytic pleocytosis.

Clinical Presentation

Symptoms typically occur after 1 week to 1 month after a bite of an infected blacklegged tick (*Ixodes scapularis*). Most *Powassan virus* (POWV) infections are asymptomatic, however infected individuals may show mild to severe symptoms such as fever, headache, nausea, vomiting, asthenia, or myalgia. There may be a transient period of remission after the acute febrile phase, followed by worsening neurological deterioration. Neuroinvasive disease may take the form of meningitis and/or encephalitis syndromes. Symptomatic individuals may have focal neurologic findings such as confusion, loss of coordination, difficulty speaking, paralysis, seizures, or coma.[5]

Approximately 50% of people who survive severe disease have long-term health problems, such as recurring headaches, loss of muscle mass and strength, and memory problems.

Laboratory Evidence

Laboratory Confirmation

- Serological demonstration of a four-fold or greater increase in POWV neutralizing antibody titres by plaque reduction neutralization testing (PRNT) between acute and convalescent sera taken 2-3 weeks apart;

  OR

- Demonstration of POWV antibodies in a single CSF or serum sample by hemagglutination inhibition (HI) or IgM ELISA with a neutralizing antibody titre by PRNT sufficient to differentiate POWV from other relevant flaviviruses;

OR

- Isolation of POWV in cell culture from an appropriate clinical specimen (e.g., tissue, blood, cerebrospinal fluid [CSF], or other body fluid);

OR

- Detection of POWV antigen by immunohistochemistry (IHC) from an appropriate clinical specimen;

OR

- Detection of POWV nucleic acid by molecular methods from an appropriate specimen;

Supportive Laboratory Evidence of Infection

- Demonstration of POWV antibodies in a single CSF or serum sample by HI or IgM ELISA without confirmation by PRNT.

Indications and Limitations

- Cross-reactivity may occur with other flaviviruses for HI and ELISA methods. PRNT is needed to increase the specificity of antibody detection at the species level.
- IgM can persist in serum for more than one year after infection, therefore IgM detection on its own is not sufficient for the diagnosis of acute infection.
- Cell culture and ICH are not routinely performed tests in Ontario.
- Molecular testing is not a sensitive test for POWV and requires pre-approval by the public health laboratory prior to testing.

For further information about human diagnostic testing, contact the PHO Laboratories at customerservicecentre@oahpp.ca or refer to the PHO Laboratory Services webpage: https://www.publichealthontario.ca/en/Laboratory-Services/About-Laboratory-Services.[6]

Case Management

In addition to the requirements set out in the Requirement #2 of the "Management of Infectious Diseases – Sporadic Cases" and "Investigation and Management of Infectious Diseases Outbreaks" sections of the *Infectious Diseases Protocol, 2018* (or as current), the board of health shall investigate cases to determine the source of

infection. Refer to Provincial Reporting Requirements above for relevant data to be collected during case investigation. Additional disease specific information may include:[3]

- Travel to endemic areas and activities in the previous 30 days[a];
- Outdoor recreational activities and outdoor occupations;
- Symptoms and date of symptom onset; and
- Date of tick bite.

Treatment is under the direction of the attending healthcare provider. Provide education to healthcare providers and at-risk communities about the infection, how it is acquired, and ways to prevent POWV.

Contact Management

Not applicable.

Outbreak Management

Not applicable.

Prevention and Control Measures

Personal Prevention Measures

Provide public education and advice on preventive measures including: Education about the mode of tick transmission and the means for personal protection such as:

- Wearing closed shoes and light-coloured, long sleeve shirts and long pants, tucking pants into socks, and using DEET, icaridin insect repellents or permethrin treated clothing[8];
- Avoiding tick-infested areas when possible;
- Avoid wooded and brushy areas with high grass and leaf litter;

[a] PHO's Lyme Disease Risk Map provides a provincial picture of where there are known blacklegged tick populations.[6]

- Walk in the center of trails;

After you come indoors;

- Check your clothing for ticks;
- Examine gear and pets[9];
- Shower soon after being outdoors;
- Check your body for ticks after being outdoors;
- Create a tick-safe zone to reduce ticks in the yard; and[10]
- Removing ticks from domestic animals.[9]

Infection Prevention and Control Strategies

The board of health shall develop and utilize a local vector-borne management strategy in order to mitigate risk. This strategy shall include measures such as:

- Local risk assessments; and
- Public education and source reduction when and where applicable.

Disease Characteristics

Aetiologic Agent – POWV infection is a tick-borne disease caused by the RNA virus POWV. POWV is a species under the genus *Flavivirus*, and can be further distinguished by genomic sequencing into two lineages: lineage I (also known as 'prototype POWV') and lineage II (also known as 'deer tick virus' or DTV).

Modes of Transmission - POWV is spread to humans by the bite of an infected tick. It may take as little as 15 minutes for POWV to be acquired from a blood-feeding tick. Less commonly, other transmission routes might exist, as there has been one case report of possible transfusion-associated infection so far documented.

Incubation Period – Signs and symptoms of POWV illness begin to typically appear from 1 week to 1 month after a bite from an infected tick.

Period of Communicability – In the reported case of possible transfusion-associated POWV infection, the asymptomatic infected blood donor reported a tick bite 1 month prior to blood donation.

Reservoir – The life cycle of POWV involves mall mammal reservoir hosts (most often rodents such as white-footed mice, groundhogs, and squirrels) and a tick vector (including the blacklegged or deer tick *Ixodes scapularis*, the groundhog tick

I. cookei, or the squirrel tick *I. marxi* in Canada). The tick can become infected as larvae, nymph, or adult when they feed on an infected reservoir host, and they remain infected for life.

Host Susceptibility and Resistance – General susceptibility, with increased risk to those that live in, work in, travel to, or visit areas of high tick prevalence or areas of known endemicity for POWV.

Please refer to PHO's Infectious Disease Trends in Ontario reporting tool and other reports for the most up-to-date information on infectious disease trends in Ontario.[11]

For additional national and international epidemiological information, please refer to the Public Health Agency of Canada and the World Health Organization.

Comments (if needed)

As this is a newly designated Disease of Public Health Significance, please send any media advisories/alerts to IDPP@ontario.ca for awareness.

References

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11. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Infectious disease trends in Ontario [Internet]. Toronto, ON: King's Printer for Ontario; c2023 [modified 2022 Dec 15; cited 2023 Jun 20]. Available from: https://www.publichealthontario.ca/en/Data-and-Analysis/Infectious-Disease/Reportable-Disease-Trends-Annually

Document History

Revision Date	Document Section	Description of Revisions
May 2023	Entire Document	New appendix - Disease is of Public Health Significance as of July 1, 2023.