

# Appendix A: Disease-Specific Chapters

**Chapter: Hantavirus pulmonary syndrome**

Effective: February 2019

# Hantavirus pulmonary syndrome

Communicable

Virulent

**Health Protection and Promotion Act:  
O. Reg. 135/18 (Designation of Diseases)**

## 1.0 Aetiologic Agent

Hantavirus is a virus in the family *Bunyaviridae*. More than 25 antigenically distinguishable viral species exist, each associated primarily with a single rodent species.<sup>1</sup>

The viruses associated with hantavirus pulmonary syndrome (HPS) in the Americas include: the Sin Nombre Virus (SNV) - a major cause of HPS in North America; Bayou virus, Black Creek Canal virus, Monongahela virus and New York virus are responsible for sporadic cases in Louisiana, Texas, Florida, New York and other areas of eastern United States. Andes, Oran, Laguna Negra, and Choclo viruses are associated with cases in South and Central America.<sup>2</sup>

## 2.0 Case Definition

### 2.1 Surveillance Case Definition

Refer to [Appendix B](#) for Case Definitions.

### 2.2 Outbreak Case Definition

The outbreak case definition varies with the outbreak under investigation. Please refer to the *Infectious Diseases Protocol, 2018* (or as current) for guidance in developing an outbreak case definition as needed.

The outbreak case definitions are established to reflect the disease and circumstances of the outbreak under investigation. The outbreak case definitions should be developed for each individual outbreak based on its characteristics, reviewed during the course of the outbreak, and modified if necessary, to ensure that the majority of cases are captured by the definition. The case definitions should be created in consideration of the outbreak definitions.

Outbreak cases may be classified by levels of probability (*i.e.* confirmed and/or probable).

Given the rarity and severity of this disease, one case should be considered an outbreak.

## 3.0 Identification

### 3.1 Clinical Presentation

Hantavirus pulmonary syndrome (HPS) infection often presents as a “flu-like” illness, with fever, headache, myalgia, dizziness, nausea and other gastrointestinal symptoms. This is followed by cough, shortness of breath, and hypotension; pulmonary edema and deterioration of cardiopulmonary function may occur rapidly. Most cases show an elevated hematocrit, hypoalbuminemia, and thrombocytopenia. The case fatality rate is 35-50%.<sup>1</sup>

### 3.2 Diagnosis

See [Appendix B](#) for diagnostic criteria relevant to the Case Definitions.

For further information about human diagnostic testing, contact the Public Health Ontario Laboratories or refer to the Public Health Ontario Laboratory Services webpage: <http://www.publichealthontario.ca/en/ServicesAndTools/LaboratoryServices/Pages/default.aspx>

## 4.0 Epidemiology

### 4.1 Occurrence

The disease was first recognized in 1993 in the Southwest USA.<sup>1</sup> Cases have been confirmed in Canada, and it was made a nationally notifiable disease in Canada in 2000.<sup>3</sup> Most cases have occurred in Alberta but cases have also been reported in British Columbia, Saskatchewan, Manitoba and Québec. Yearly case numbers range from zero to 13. All cases occurred in rural settings and approximately 70% of the cases have been associated with domestic and farming activities.<sup>4</sup> Incidence appears to coincide with the distribution and population density of infected carrier rodents and with their level of infection.<sup>1</sup>

In Ontario, hantavirus has been identified in deer mice and meadow voles.<sup>3</sup> The location of the mice in Ontario included Algonquin Park, Timmins, Killarney Provincial Park and Rondeau Provincial Park (Dr. Robbin Lindsay, Public Health Agency of Canada, personal communication). No human cases of HPS have been reported in Ontario since the disease became reportable in 2001.<sup>5</sup>

Please refer to Public Health Ontario’s (PHO) Reportable Disease Trends in Ontario reporting tool and other reports for the most up-to-date information on infectious disease trends in Ontario.

<http://www.publichealthontario.ca/en/DataAndAnalytics/Pages/DataReports.aspx>

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

## 4.2 Reservoir

The major reservoir of Sin Nombre virus in North America is the deer mouse, found primarily in rural and semi-rural areas, often in barns and old buildings. Antibodies against the virus have also been found in pack rats, chipmunks, and other rodents.<sup>3</sup>

## 4.3 Modes of Transmission

Infected rodents shed live virus in their saliva, feces and urine, with maximal virus concentration in the lungs.<sup>1</sup> Transmission primarily occurs through inhalation of aerosolized virus particles from rodent saliva, urine or feces; through the bites of infected rodents; and through direct contact of broken skin or mucous membrane with rodent excreta.<sup>2</sup> Indoor exposure in closed, poorly ventilated homes, vehicles and outbuildings with visible rodent infestation is particularly important.<sup>1</sup>

## 4.4 Incubation Period

Not completely defined, however most often it has been found to be approximately 2 weeks after exposure, with a range from a few days to 6 weeks.<sup>1</sup>

## 4.5 Period of Communicability

No person-to-person spread has been documented in North America. However, nosocomial and household transmission of Andes virus has been documented in Argentina and Chile, although it is believed to be rare and associated with direct contact.<sup>1,4</sup>

## 4.6 Host Susceptibility and Resistance

All persons without prior infection are presumed to be susceptible. Protection and duration of immunity conferred by previous infection is unknown, but antibodies seem to persist for several years. Rural populations, cottagers and campers, and laboratory workers are most at risk in endemic areas.<sup>1</sup> Any indoor exposure in enclosed, poorly ventilated areas with a visible rodent infestation increases risk of infection.

## 5.0 Reporting Requirements

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:

- *Ontario Regulation 569* (Reports) under the *Health Protection and Promotion Act* (HPPA);<sup>6</sup>
- The iPHIS User Guides published by PHO; and
- Bulletins and directives issued by PHO.

## 6.0 Prevention and Control Measures

### 6.1 Personal Prevention Measures

Rodent control in and around the home is the primary strategy for preventing hantavirus infection:<sup>1,2</sup>

- Eliminate food sources available to rodents (e.g. storing food meant for humans and animals in a manner that would protect it from rodents);
- Limit possible nesting sites; seal holes and other possible entrances for rodents and use “snap traps” and rodenticides;
- Do not sweep or vacuum rodent contaminated areas; use a wet mop or towel moistened with disinfectant. Disinfect rodent contaminated areas by spraying a disinfectant solution, e.g. diluted bleach (1:10);
- Wear gloves when cleaning rodent contaminated areas and perform hand hygiene after cleaning;
- Avoid inhalation of dust by using approved respirators when cleaning previously unoccupied areas; and
- Avoid wild rodents and direct contact with areas where there is evidence of rodents.

### 6.2 Infection Prevention and Control Strategies

In cases involving hospitalization, routine practices are recommended.<sup>2</sup>

Refer to the Provincial Infectious Diseases Advisory Committee (PIDAC) Routine Practices and Additional Precautions in All Health Care Settings, 3<sup>rd</sup> Edition (or as current).

Refer to Public Health Ontario’s website at [www.publichealthontario.ca](http://www.publichealthontario.ca) to search for the most up-to-date information on Infection Prevention and Control (IPAC).

### 6.3 Management of Cases

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 Section 5: Reporting Requirements above for relevant data to be collected during case investigation.

The following disease-specific information should also be obtained during case management:

- Exposure history, including travel and occupational history involving handling of rodents in the previous 6 weeks.

Supportive treatment for respiratory symptoms is under the direction of the attending health care provider. No specific treatment or cure.

Provide education about the illness and how to prevent exposure.

## 6.4 Management of Contacts

Not applicable unless exposed to a common source, then as above.

## 6.5 Management of Outbreaks

**Given the rarity of this disease, one case should be considered an outbreak.**

Please see the *Infectious Diseases Protocol, 2018* (or as current) for the public health management of outbreaks or clusters in order to identify the source of illness, manage the outbreak and limit secondary spread. In addition, provide public health management of outbreaks or clusters in order to identify the source of illness and stop the outbreak.

Outbreak management should focus on:

- Rodent control;
- Public education about rodent avoidance and control; and
- Surveillance for hantavirus infection in wild rodents.

## 7.0 References

1. Heymann DL, editor. *Control of Communicable Diseases Manual*. 20 ed. Washington, D.C: American Public Health Association; 2015.
2. Committee on Infectious Diseases, American Academy of Pediatrics. Section 3: Summaries of Infectious Diseases: Hantavirus Pulmonary Syndrome. In: Kimberlin DW, Brady MT, Jackson MA, Long SS, editors. *Red Book: 2018 Report of the Committee on Infectious Diseases*. 31 ed. Itasca, IL: American Academy of Pediatrics; 2018.
3. Drebot M, Artsob H, Werker D. Hantavirus pulmonary syndrome in Canada, 1989-1999. *Canada Communicable Disease Report*. 2000;26(8):65-9.
4. Drebot M, Jones S, Grolla A, Safronetz D, Strong J, Kobinger G, et al. Hantavirus pulmonary syndrome in Canada: An overview of clinical features, diagnostics, epidemiology and prevention. *Canada Communicable Disease Report*. 2015;41(6):124-31.
5. Ontario Agency for Health Protection and Promotion (Public Health Ontario). *Reportable Disease Trends in Ontario, 2016* [Internet]. Toronto, ON: Queen's Printer for Ontario; 2018 [updated March 29, 2018; cited June 14, 2018]. Available from: <https://www.publichealthontario.ca/en/dataandanalytics/pages/rdto.aspx#/22>
6. Health Protection and Promotion Act, R.S.O. 1990, Reg. 569, Reports, (2018). Available from: <https://www.ontario.ca/laws/regulation/900569>

## 8.0 Document History

Table 1: History of Revisions

Revision Date	Document Section	Description of Revisions
December 2014	General	<p>New template.</p> <p>Title of Section 4.6 changed from “Susceptibility and Resistance” to “Human Host Susceptibility and Resistance”.</p> <p>Title of Section 5.2 changed from “To Public Health Division (PHD)” to “To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry”.</p> <p>Section 9.0 Document History added.</p>
December 2014	1.0 Aetiologic Agent	<p>Second paragraph change from: “...and Bayou virus, Black Creek Canal virus, and the New York virus sporadic causes in Louisiana, Florida and New York respectively” to “...and Bayou virus which causes sporadic cases in Louisiana; Black Creek Canal virus, responsible for sporadic disease in Florida; and the New York virus, which causes sporadic cases in New York.”</p>
December 2014	2.2 Outbreak Case Definition	<p>First paragraph: addition that consideration should be given to the “provincial surveillance case definition” in addition to the list provided.</p> <p>Second paragraph: addition of “Outbreak” at beginning of paragraph.</p> <p>New paragraph inserted: <b>“Given the rarity and severity of this disease, one case should be considered an outbreak.”</b></p>
December 2014	3.1 Clinical Presentation	<p>Removal of “and then” before “pulmonary edema”.</p> <p>Change from: “The crude fatality rate is 40-50%” to “The case fatality rate is 35-50%”.</p>
December 2014	3.2 Diagnosis	<p>Entire section revised.</p>

Revision Date	Document Section	Description of Revisions
December 2014	4.1 Occurrence	<p>Paragraph removed: “There have been no confirmed cases of HPS reported in Ontario. Given the severity and rarity of Hantavirus infection, a single confirmed case constitutes an important public health issue”.</p> <p>New paragraph added: “In Ontario, hantavirus has been identified in deer mice and meadow voles. The location of the mice....”</p> <p>Addition of referral to PHO Monthly Infectious Diseases Surveillance Reports.</p>
December 2014	5.1 To Local Board of Health	<p>At beginning of paragraph, deletion of “Confirmed and suspected cases...” replaced by “Individuals who have or may have hantavirus pulmonary syndrome...”</p> <p>Addition of “as soon as possible”.</p>
December 2014	5.2 To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry	<p>At beginning of paragraph, deletion of “Report only case classifications specified in the case definition to PHD...” replaced by “Cases shall be reported...”</p> <p>“The disease-specific User Guides published by the ministry, and” changed to “The iPHIS User Guides published by PHO, and”.</p> <p>“Bulletins and directives issued by the ministry” changed to “Bulletins and directives issued by PHO”.</p>
December 2014	6.2 Infection Prevention and Control Strategies	Addition of second and third paragraphs.
December 2014	6.3 Management of Cases	<p>Addition of “Information that must be reported to the medical officer of health is specified in <i>Ontario Regulation 569</i> under the HPPA.”</p> <p>Insertion of “hantavirus pulmonary syndrome” to first sentence of second paragraph.</p>

Revision Date	Document Section	Description of Revisions
December 2014	6.5 Management of Outbreaks	<p>Deletion of: “An outbreak is defined as two or more cases linked in place and time”.</p> <p>Addition of: <b>“Given the rarity of this disease, one case should be considered an outbreak.”</b></p> <p>Inserted reference to <i>Infectious Diseases Protocol</i> at beginning of third paragraph.</p>
December 2014	7.0 References	Updated.
December 2014	8.0 Additional Resources	Updated.
February 2019	General	<p>Minor revisions were made to support the regulation change to Diseases of Public Health Significance, Hantavirus is designated a disease of public health significance and is now classified as communicable. Common text included in all Disease Specific chapters: Surveillance Case Definition, Outbreak Case Definition, Diagnosis, Reporting Requirements, Management of Cases, and Management of Outbreaks. The epidemiology section and references were updated and Section 8.0 Additional Resources was deleted.</p>
February 2019	1.0 Aetiologic Agent	Minor revisions to paragraph two.
February 2019	3.1 Clinical Presentation	Minor revisions to the entire section.
February 2019	4.2 Reservoir	Entire section updated.
February 2019	4.3 Modes of Transmission	<p>Sentence added to end of paragraph, “Indoor exposure in closed, poorly ventilated homes, vehicles and outbuildings with visible rodent infestation is particularly important.”</p>

