Ministry of Health and Long-Term Care

Infectious Diseases Protocol

Appendix A: Disease-Specific Chapters

Chapter: Plague

Effective: February 2019

Ontario

Plague

☒ Communicable

☒ Virulent

Health Protection and Promotion Act:
O. Reg. 135/18 - Designation of Diseases

1.0 Aetiologic Agent

The causative agent of plague is *Yersinia pestis (Y. pestis)*, a gram-negative *coccobacillus*.[1,2]

Aerosolized plague is a potential bioterrorism agent.

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 severity of disease and rarity of plague in Canada, and in the absence of travel-related or foreign exposure, a single confirmed case constitutes an outbreak.

3.0 Identification

3.1 Clinical Presentation

Clinical illness is characterized by fever, chills, headache, malaise, prostration, nausea, sore throat and leukocytosis manifesting in one or more of the three main forms of plague in humans:

1. Bubonic plague: The most common form of human plague, resulting from the bite of an infected flea that has fed on an infected rodent, such as a rat. It presents as acute lymphadenitis in lymph nodes that drain the site of the flea bite, forming a bubo. Flea bites on the legs typically result in the appearance of inguinal buboes. Axillary buboes can be associated with flea bites as well, and are often seen after the handling of infected animals. Cervical buboes are rare in industrialized countries, but are relatively common in developing countries where people sleep on dirt floors. Lymph nodes become swollen and tender and may suppurate; fever is present.
2. Septicemic plague: All forms of plague, including those without lymphadenopathy, may progress to septicemic plague, with dissemination of the bacillus by the bloodstream to diverse parts of the body, including the meninges.
3. Pneumonic plague: An infection of the lungs caused by the plague bacillus. Secondary involvement of the lungs results in pneumonia; mediastinitis or pleural effusion may develop. Secondary pneumonic plague is of special significance, since respiratory droplets may serve as the source of person-to-person transfer with resultant primary pneumonic plague.[1,2]

Untreated bubonic plague has a fatality rate of 50%; pneumonic and septicemic plagues are fatal if not treated.[1]

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

Plague is endemic in Africa, South America, Western USA, Asia, and South Eastern Europe.[1] Plague is also present in Canadian wildlife populations in an area of uncertain size in southern Saskatchewan, Alberta and British Columbia, as confirmed by surveys conducted in the 1930s and 1990s.[3] Transmission of plague to humans in Canada is extremely rare. The last reported human case occurred in 1939.[4]

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

Wild rodents, such as ground squirrels, play a key role in maintaining natural plague cycles by serving as amplifying hosts and sources of infection for the flea vectors of the disease. Rabbits and hares, wild carnivores and domestic cats may also become infected and act as sources of infection to people.[1]

4.3 Modes of Transmission

Bubonic: Bite from an infected flea, which is the most common mode of transmission, or by handling tissues of an infected animal.[2]

Pneumonic: Inhalation of droplets or contact with sputum from an infected person or animal.[2]

Cats may occasionally transmit infection through bites, scratches, or respiratory droplets. Cats also develop plague abscesses that have been a source of infection to veterinary personnel.[1]

Note: Septicemic plague: All forms of plague may progress to septicemic plague.

4.4 Incubation Period

From 1-7 days for bubonic plague and 1-4 days for primary pneumonic plague.[1]

4.5 Period of Communicability

Bubonic plague is not usually transmitted directly from person to person, unless there is contact with pus from suppurating buboes. Pneumonic plague can be highly communicable under appropriate climatic conditions, with overcrowding and cool temperatures facilitating transmission.[1]

Fleas may remain infective for months.[1]

4.6 Host Susceptibility and Resistance

Susceptibility is general.[1] Plague affects all age groups, though 50% of cases occur in ages 12 to 45.[4] Immunity after recovery is relative and may not protect against a large infective dose.[1]

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);[5]
- 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

Preventive measures:

- Avoid exposure to fleas and take precautions to protect against flea bites by using insect repellents when traveling in endemic areas and control fleas on indoor pets.
- Wear gloves when hunting and handling wildlife.
- Veterinarians and their staff should wear gloves and masks when examining sick cats.[1,2]

6.2 Infection Prevention and Control Strategies

Use routine practices for hospitalized cases as well as droplet precautions until pneumonia is excluded and appropriate therapy has been initiated; droplet precautions should be continued for 48 hours after initiation of effective treatment in cases with pneumonic plague.[2]

Refer to PHO's website at www.publichealthontario.ca to search for the most up-to-date information on Infection Prevention and Control including Routine Practices and Additional Practices in All Health Care Settings (2012, or as current).

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.

Every case should be followed up as soon as possible to determine the source of exposure and eliminate the potential that the case is a result of bioterrorism.

Case investigation and follow-up will be done in consultation with the ministry, PHO and the Public Health Agency of Canada.

The following disease-specific information may also be collected:

- History of travel in the relevant incubation period;
- Exposure to fleas, rodents, wild carnivores or domestic cats;
- High risk occupation such as veterinary medicine or trapping; and
- Exposure to other potential cases.[1]

Provide education about the infection and how it is spread. Advise on the use of insecticides and repellants on clothing and luggage of infected persons.[1]

Treatment is under the direction of the attending health care provider. Refer to the resources and references listed below for more information on treatment.

Note: Given the potential for the appearance of plague cases in signaling a bioterrorism incident, investigation and follow-up may involve the activation of the emergency management system in place in the province, including the Health System Emergency Management Branch of the ministry and relevant health emergency response plans, as well as those additional ministries with responsibilities for security, law enforcement, or other relevant areas of concern, as identified in the Emergency Management and Civil Protection Act and associated Order in Council.

6.4 Management of Contacts

Contacts of pneumonic plague are household members and those that have been within 2 meters of a coughing patient in the previous 7 days.[1,2]

For contacts of pneumonic plague:

- Provide antibiotic prophylaxis and place under surveillance for 7 days; those who refuse prophylaxis should be maintained in strict isolation with careful surveillance for 7 days.[1]

Contacts of bubonic plague are those that have had direct contact with infected body fluids or tissues (*e.g.* fluids from buboes).

In all cases where a case or contacts have been exposed to fleas, eliminate fleas.[1]

6.5 Management of Outbreaks

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.

A single case of plague should be managed with great urgency. If there is suspicion of a bioterrorism event, notify the ministry immediately.

In the absence of travel-related or foreign acquired exposure, one case should be considered an outbreak.

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: Plague. 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. Leighton FA. Wildlife Pathogens and Diseases in Canada. Canadian Biodiversity: Ecosystem Status and Trends 2010, Technical Thematic Report No. 7. Ottawa, ON: Canadian Councils of Resource Ministers; 2011. Available from: http://www.biodivcanada.ca/default.asp?lang=En&n=137E1147-0

4. Government of Canada. Plague [Internet]. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2018 [updated June 18, 2018; cited June 20, 2018]. Available from: https://www.canada.ca/en/public-health/services/diseases/plague.html
5. 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	New template. Title of Section 4.6 changed from "Susceptibility and Resistance" to "Host Susceptibility and Resistance". 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". Section 9.0 Document History added.
December 2014	1.0 Aetiologic Agent	"Plague" changed to lower case.
December 2014	2.2 Outbreak Case Definition	Entire section revised.
December 2014	3.1 Clinical Presentation	"…resulting from a flea bite" changed to "resulting from the bite of an infected flea…"
December 2014	3.2 Diagnosis	Entire section revised.
December 2014	4.1 Occurrence	Entire section revised.
December 2014	4.4 Incubation Period	"primary plague pneumonia" changed to "primary pneumonic plague".
December 2014	4.5 Period of Communicability	Addition of "from person to person". "climatic conditions" changed to "environmental conditions".
December 2014	5.1 To Local Board of Health	Entire section revised.

Revision Date	Document Section	Description of Revisions
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	Entire section revised.
December 2014	6.2 Infection Prevention and Control Strategies	Addition of "Refer to PIDAC *Routine Practices*…" Addition of "Refer to Public Health Ontario…"
December 2014	6.3 Management of Cases	Entire section revised.
December 2014	6.4 Management of Contacts	Entire section revised.
December 2014	6.5 Management of Outbreaks	Entire section revised.
December 2014	7.0 References	Updated.
December 2014	8.0 Additional Resources	Updated.
February 2019	General	Minor revisions were made to support the regulation change to Diseases of Public Health Significance. 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 identification and epidemiology section and references were updated and Section 8.0 Additional Resources was deleted.
February 2019	3.1 Clinical Presentation	Bubonic plague section revised.

Revision Date	Document Section	Description of Revisions
February 2019	4.1 Occurrence	Removed sentence: “The last laboratory confirmed cases of plague in Canadian wildlife included two bushy-tailed prairie dog from a prairie dog colony located within Grasslands National Park near Val Marie, Saskatchewan in 2010.”
February 2019	4.2 Reservoir	Entire section revised.
February 2019	4.3 Modes of Transmission	Added: “Cats may occasionally transmit infection through bites, scratches, or respiratory droplets. Cats also develop plague abscesses that have been a source of infection to veterinary personnel”.
February 2019	4.5 Period of Communicability	Minor revisions to entire section.
February 2019	4.6 Host Susceptibility and Resistance	Added sentence: “Plague affects all age groups, through 50% of cases occur in ages 12 to 45.”
February 2019	6.1 Personal Prevention Measures	Added bullet three and four: “Wear gloves when hunting and handling wildlife. Veterinarians and their staff should wear gloves and masks when examining sick cats.”


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