

Appendix A: Disease-Specific Chapters

Chapter: Anthrax

Effective: February 2019

Anthrax

Communicable

Virulent

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

1.0 Aetiologic Agent

The aetiological agent of anthrax is the bacterium *Bacillus anthracis* (*B. anthracis*), an aerobic, gram-positive, encapsulated, spore forming, non-motile rod.¹

Anthrax can result from natural infection or secondary to a bioterror event.²

2.0 Case Definition

2.1 Surveillance Case Definition

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

2.2 Outbreak Case Definition

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

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).

3.0 Identification

3.1 Clinical Presentation

Depending on the route of transmission, anthrax infection can result in four clinical syndromes: cutaneous, inhalation, gastrointestinal, and injection.¹

Cutaneous anthrax is characterized by initial itching of the exposed skin surface; an initial vesicle at the site of inoculation develops into a painless black eschar; fever, malaise and headache may be present.¹

Inhalational anthrax is the most lethal form of disease. Initial presentation includes fever, malaise, mild cough, dyspnea, nausea or vomiting, and this is followed by acute onset of respiratory distress and shock; there is also radiological evidence of mediastinal widening and pleural effusion present.^{1,2}

Gastrointestinal anthrax cases present with acute nausea, vomiting, abdominal distension, pain, fever, gastrointestinal (GI) bleeding and peritonitis.¹

Injection anthrax cases, associated with heroin use, have emerged in recent years and have been seen in heroin-injecting drug users in northern Europe. This type of infection has never been reported in Canada. Patients with injection anthrax have not presented with typical symptoms associated with the preceding three classical forms of anthrax. Most patients have serious localized soft tissue infections accompanied by significant soft tissue edema. Fever is not a prominent feature and pain is less severe than with other serious soft tissue infections. Not all cases have localized injection-related lesions; some cases have presented with symptoms more typical of systemic anthrax infections.¹ Injection anthrax can spread throughout the body faster and be harder to recognize and treat. Many other more common bacteria can cause skin and injection site infections, so a skin or injection site infection in a drug user does not necessarily mean the person has anthrax.³

Systemic illness can result from hematogenous and lymphatic dissemination with any form of anthrax. Anthrax meningitis can occur in any patient with systemic illness and in patients without other apparent clinical presentations.² Anthrax meningitis begins with hypotension, quickly followed by delirium or coma; refractory seizures, cranial nerve palsies, and myoclonus have been reported. Case fatality rate for meningitis exceeds 90%.²

3.2 Diagnosis

Laboratory demonstration of *B. anthracis* obtained from blood, cerebrospinal fluid, pleural fluid, ascitic fluid, vesicular fluid or lesion exudate.^{1,2}

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

Anthrax is primarily a disease of herbivores; humans and carnivores are incidental hosts. In most industrialized countries, anthrax is an infrequent and sporadic human

infection, and is primarily an occupational hazard of veterinarians, agriculture and wildlife workers, slaughterhouse workers, and those who process meat, hides, hair, wool or bone.¹

The occurrence of anthrax outbreaks in Canadian wild bison and livestock appear linked to climatic factors, particularly in periods of intense precipitation followed by drought.⁴ Anthrax is infrequently found in Ontario livestock, with the last positive cases diagnosed in cattle herds in northwestern Ontario in 2006, and southern Ontario in 1996.

Human cases of anthrax have not been reported in Ontario since 1990.

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 main reservoirs of anthrax are animals, both livestock and wildlife, as well as soil where anthrax spores may remain dormant for years and are a potential source of infection for grazing livestock,¹ particularly in the wake of periods of intense precipitation followed by drought. The skins, hides, hair, and other products from infected animals may pose a risk to those coming into contact with them.¹

4.3 Modes of Transmission

Transmission occurs by inoculation through open skin via contact with infected animal tissue, other animal products (especially animal skins), and contaminated soil; by ingestion of undercooked, contaminated or raw meat; and following injection of drugs (e.g. heroin) that have been contaminated with anthrax spores.^{1,2} Inhalational anthrax results from the inhalation of anthrax spores, particularly in risky industrial settings such as animal skin processing facilities, or as a result of a bioterrorist incident.¹

4.4 Incubation Period

From 1-7 days, although incubation periods of up to 60 days are possible.¹

4.5 Period of Communicability

Person-to-person transmission is rare. Articles and soil contaminated with spores may remain infective for years.¹

4.6 Host Susceptibility and Resistance

There is some evidence of inapparent infection among individuals in frequent contact with the infectious agent. Post-infective immunity may be incomplete, and subsequent reinfections may occur, though reports of such second attacks are rare.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 include but are not limited to:¹

- Education about the modes of transmission, care of skin abrasions, and hand washing to members of the public visiting areas where anthrax is known to exist
- Education regarding the importance of hand washing after touching animals in petting zoos, on farms, etc.
- Controlling the disease in animals at risk through maintenance of active immunization and treatment of active animal cases
- Immunizing high risk individuals such as laboratory workers and animal handlers, where indicated
- Use of proper ventilation in hazardous industries and the use of protective clothing and equipment, where indicated
- Avoiding contact with any suspicious or unknown powdery substances if bioterrorism is suspected

6.2 Infection Prevention and Control Strategies

Strategies:^{1,2}

- For hospitalized persons routine practices are recommended.
- Persons who may have been exposed to anthrax are not contagious, so quarantine is not appropriate
- Persons with open and/or draining lesions should be cared for using contact precautions. Dressings with drainage from the lesions should be incinerated, autoclaved, or otherwise disposed of as biohazard waste
- Controlling the disease in animals at risk through maintenance of active immunization and treatment of active animal cases

Refer to PIDAC Routine Practices and Additional Practices in All Health Care Settings, 3rd edition (2012, or as current).⁶

Refer to Public Health Ontario’s website at 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 ensure every case is 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 of Health and Long-Term Care (ministry), Public Health Ontario (PHO) and the Public Health Agency of Canada.

Management of cases should also include contacting the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), if exposure to infected livestock is considered the likely source.

Epidemiological investigation:

Information that must be reported to the medical officer of health is specified in *Ontario Regulation 569* under the HPPA.⁵

Investigate cases of anthrax to determine the source of infection, whether other cases may have been exposed to any identified source, and to determine whether bioterrorism is a possibility. 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:

- Symptoms and date of symptom onset
- History of out-of-province and international travel
- History of exposure including contact with ruminants that have died acutely
- Earliest and latest exposure dates
- Occupation

Exposure investigation:

In collaboration with the ministry and PHO:

- Determine what samples of suspected sources to collect for laboratory analysis
- Determine appropriate sampling medium and techniques
- Inspect premises associated with illness

Provide information related to anthrax, including information on transmission and on risk factors.

Treatment of the case should be under the direction of an infectious diseases specialist. Refer to the resources and references listed below for more information on treatment.

In collaboration with the ministry and PHO, determine what communication and notification is required about the case.

Note: Given the potential for the appearance of anthrax cases to signal 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. The Ministry Emergency Response Plan (MERP) provides information on how the ministry would respond to an emergency. Please see the following link for further information:

http://www.health.gov.on.ca/english/providers/program/emu/emerg_prep/emerg_resp_plan.html

6.4 Management of Contacts

Although there is no person to person transmission, there could be a possibility of exposure to a common source; consultation with infectious disease experts may be prudent for decisions with regard to post-exposure prophylaxis.

6.5 Management of Outbreaks

Please see the *Infectious Diseases Protocol, 2018*, (or as current) for steps in managing outbreaks. A single case of anthrax should be managed with great urgency. If there is suspicion of a bioterrorism event, notify the Office of the Fire Marshall and Emergency Management.

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

In addition to the *Infectious Diseases Protocol, 2018* (or as current), the following should be considered:

- Active identification and follow-up of cases and persons exposed to a common source of infection
- Alerts for medical community and hospitals
- Public information and communication plans
- Control of contacts, including field workers involved in the implementation of environmental control measures
- Environmental control measures

The OMAFRA should also be involved where the source of infection is determined to be livestock.

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: Anthrax. 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. Centers for Disease Control and Prevention. Injection Anthrax [Internet]. Atlanta, GA: U.S. Department of Health & Human Services 2014 [updated July 21, 2014; cited May 15, 2018]. Available from: <https://www.cdc.gov/anthrax/basics/types/injection.html>
4. 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>
5. Health Protection and Promotion Act, R.S.O. 1990, Reg. 569, Reports, (2018). Available from: <https://www.ontario.ca/laws/regulation/900569>
6. Ontario Agency for Health Protection and Promotion (Public Health Ontario) PIDAC. Routine Practices and Additional Precautions in All Health Care Settings, 3rd edition. Toronto, ON: Queen's Printer for Ontario; 2012. Available from: https://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/PIDAC/Pages/Routine_Practices_Additional_Precautions.aspx

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 “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	Second paragraph, “bioterrorist” replaced with “bioterrorism”.

Revision Date	Document Section	Description of Revisions
December 2014	2.2 Outbreak Case Definition	<p>Paragraph one, sentence two, changed from “Consideration should be given to the following in establishing an outbreak case definition” to “Consideration should be given to the provincial surveillance case definition and the following criteria when establishing an outbreak case definition”.</p> <p>Paragraph two changed from “Cases may be classified by levels of probability (e.g. confirmed, probable or suspect) to “Outbreak cases may be classified by levels of probability (i.e. confirmed, probable and/or suspect).”</p> <p>Addition of a third paragraph, “Given the severity of disease and rarity of anthrax in Ontario, in the absence of travel-related or foreign exposure, a single confirmed case constitutes an outbreak.”</p>

Revision Date	Document Section	Description of Revisions
December 2014	3.1 Clinical Presentation	<p>Paragraph one changed from “Depending on the route of transmission of infection, anthrax disease can result in four clinical syndromes: cutaneous, inhalation, intestinal and oropharyngeal” to “Depending on the route of transmission, anthrax infection can result in three clinical syndromes: cutaneous, inhalation and gastrointestinal.”</p> <p>Paragraph three, sentence three, changed from “Fatality rate is extremely high” to “The case fatality rate is extremely high.”</p> <p>Paragraph four changed from “Intestinal anthrax presents in acute vomiting, abdominal distension, GI bleeding, and peritonitis” to “Gastrointestinal anthrax cases present with acute vomiting, abdominal distension, gastrointestinal (GI) bleeding and peritonitis.”</p> <p>Deletion of “Symptoms of oropharyngeal anthrax include fever, neck swelling due to lymphadenopathy, throat pain, oral ulcers and sepsis.”</p> <p>New paragraph added, “Recently, another type of anthrax infection has been identified in heroin-injecting drug users in northern Europe. This type of infection has never been reported in Canada. Symptoms may be similar to those of cutaneous anthrax, but there may be infection deep under the skin or in the muscle where the drug was injected. Injection anthrax can spread throughout the body faster and be harder to recognize and treat. Many other more common bacteria can cause skin and injection site infections, so a skin or injection site infection in a drug user does not necessarily mean the person has anthrax.”</p>

Revision Date	Document Section	Description of Revisions
December 2014	3.2 Diagnosis	<p>First paragraph, “See Appendix B” moved to third paragraph. Addition of “for diagnostic criteria relevant to Case Definitions”.</p> <p>Addition of second paragraph, “For further information about human diagnostic testing, contact the Public Health Ontario Laboratories or refer to the Public Health Ontario Laboratory Services webpage...”</p>
December 2014	4.1 Occurrence	Entire section revised.
December 2014	4.2 Reservoir	<p>First sentence, changed from “where the spores” to “where anthrax spores”.</p> <p>First sentence, addition of “particularly in the wake of periods of intense precipitation followed by drought.”</p>
December 2014	4.3 Modes of Transmission	<p>First sentence, changed from “other animal products and contaminated soil and by ingestion of undercooked, contaminated or raw meat” to “other animal products (especially animal skins), and contaminated soil; by ingestion of undercooked, contaminated or raw meat; and following injection of drugs (e.g. heroin) that have been contaminated with anthrax spores.”</p> <p>Second sentence, addition of “such as animal skin processing facilities, or as a result of a bioterrorist incident.”</p>
December 2014	4.6 Host Susceptibility and Resistance	<p>First sentence, “people” changed to “individuals”.</p> <p>First sentence, removed “second attacks can occur, but reports are rare.”</p> <p>Second sentence added, “Post-infective immunity may be incomplete, and subsequent reinfections may occur, though reports of such second attacks are rare.”</p>

Revision Date	Document Section	Description of Revisions
December 2014	5.1 To local Board of Health	<p>First sentence, changed “Confirmed and suspected cases should be reported immediately” to “Individuals who have or may have anthrax shall be reported as soon as possible”.</p> <p>First sentence, addition of “(HPPA)”.</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>First paragraph, replaced “the PHD of the MOHLTC” with “PHO”.</p> <p>Second paragraph, changed “Report only case classifications specific in the case definition to PHD” to “Cases shall also be reported”.</p> <p>Second paragraph, addition of “and Outbreaks”.</p> <p>Bullet two, changed from “The disease-specific User Guides published by the Ministry” to “The iPHIS User Guides published by PHO”.</p> <p>Bullet three, replaced “the Ministry” with “PHO”.</p>
December 2014	6.1 Personal Prevention Measures	<p>Sixth bullet changed from “Avoid contact with any powder substance if bioterrorism is suspected” to “Avoiding contact with any suspicious or unknown powdery substances if bioterrorism is suspected”.</p>

Revision Date	Document Section	Description of Revisions
December 2014	6.2 Infection Prevention and Control Strategies	<p>Bullet one, removed “and the use of contact precautions for cases with open lesions”.</p> <p>Previous second bullet moved down to become the fourth bullet.</p> <p>New second bullet added, “Persons who may have been exposed to anthrax are not contagious, so quarantine is not appropriate.”</p> <p>Third bullet added, “Persons with open and/or draining lesions should be cared for using contact precautions. Dressings with drainage from the lesions should be incinerated, autoclaved, or otherwise disposed of as biohazard waste.”</p>

Revision Date	Document Section	Description of Revisions
December 2014	6.3 Management of Cases	<p>First paragraph changed from “One case is deemed a public health emergency” to “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.”</p> <p>Paragraph two, addition of “PHO”.</p> <p>Paragraph three, replaced “Canadian Food Inspection Agency (CFIA) with “Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA).”</p> <p>Entire fourth paragraph changed.</p> <p>Paragraph five, addition of “and PHO”.</p> <p>Removed paragraph seven.</p> <p>Previous paragraph eight becomes paragraph seven. Previous paragraph nine becomes paragraph eight.</p> <p>Paragraph eight, addition of “and PHO”.</p> <p>Under Note subsection, first sentence, replaced “these” with “anthrax”.</p> <p>Under Note subsection, first sentence, replaced “bioterror” with “bioterrorism”.</p> <p>Under Note subsection, first sentence, replaced “Unit” with “Branch”.</p>
December 2014	6.4 Management of Contacts	<p>Replaced “same” with “common”.</p> <p>Addition of “for decisions with regard to post-exposure prophylaxis.”</p>

Revision Date	Document Section	Description of Revisions
December 2014	6.5 Management of Outbreaks	<p>Paragraph one, removed “Consider the following outbreak control measures”.</p> <p>Addition of a second paragraph, “In the absence of travel-related or foreign exposure, one case should be considered an outbreak.”</p> <p>Addition of a third paragraph ahead of the bullets, “Consider the following outbreak control measures...”</p> <p>Bullet two, changed from “Active finding of cases and persons exposed to the same source of infection” to “Active identification and follow-up of cases and persons exposed to a common source of infection”.</p> <p>Paragraph four, changed from “As well as collaboration with CFIA, the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) should also be involved” to “The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) should also be involved.”</p> <p>Paragraph five, changed from “As per this Protocol, outbreak management shall comprise of but not be limited to the following general steps” to “As per the <i>Infectious Diseases Protocol, 2008</i> (or as current), outbreak management shall be comprised of, but not limited to, the following general steps”.</p>
December 2014	7.0 References	Updated.
December 2014	8.0 Additional Resources	Updated.

Revision Date	Document Section	Description of Revisions
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 epidemiology section and references were updated and Section 8.0 Additional Resources was deleted.
February 2019	1.0 Aetiologic Agent	Second paragraph, changed from “B. anthracis is a potential bioterrorism agent” to “Anthrax can result from natural infection or secondary to a bioterror event”.
February 2019	3.1 Clinical Presentation	Entire section revised.
February 2019	4.2 Reservoir	Sentence added: “The skins, hides, hair, and other products...”

