

# Appendix A: Disease-Specific Chapters

**Chapter: Brucellosis**

Effective: February 2019

# Brucellosis

Communicable

Virulent

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

## 1.0 Aetiologic Agent

Brucellosis is caused by the bacterium *Brucella*. *Brucella* species are small, nonmotile, gram-negative coccobacilli. The species that most commonly infect humans include *B. suis*, *B. abortus*, *B. melitensis*, and *B. canis*.<sup>1</sup> While rare, *B. ceti* (reservoirs: dolphins, porpoises, whales), *B. pinnipedialis* (sea lions, seals, walruses) and *B. inopinata* (unknown reservoir) are recently described *Brucella* species known to also cause disease in humans.<sup>2,3</sup>

*Brucella* spp. are potential bioterrorism agents.<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).

## 3.0 Identification

### 3.1 Clinical Presentation

Acute or insidious onset of symptoms, such as intermittent fever, headache, weakness, profuse sweating, chills, arthralgia, depression, weight loss, and generalized aching. Localized infections of organs, including the liver and spleen, may be present. Physical

findings include lymphadenopathy, hepatosplenomegaly and occasionally arthritis. Serious complications include meningitis, endocarditis and osteomyelitis. Disease may last days, months, or occasionally a year or more if not adequately treated.<sup>1,2</sup>

## 3.2 Diagnosis

Laboratory demonstration of *Brucella* in blood or appropriate clinical specimen.<sup>1,2</sup>

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

Worldwide, especially in Mediterranean countries, the Middle East, Africa, Asia, Central and South America, India and Mexico.<sup>2</sup> The disease is often unrecognized and under-reported.

Predominantly an occupational disease of those who work with infected animals or their tissues, especially farm workers, veterinarians, meat inspectors and abattoir workers. Infection is more common in those who consume undercooked meat including raw caribou, raw milk or raw milk products.<sup>2</sup> There have been reports of isolated cases of infection with *B. canis* occurring in animal handlers from contact with dogs, and *B. suis* occurring in those with contact with feral swine.<sup>2</sup>

Between 2013 and 2017, an average of four cases of brucellosis were reported per year in Ontario, a number of which were related to travel.\*

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

Domestic animals such as cattle, swine, goats and sheep as well as wild animals such as caribou, bison, elk and some species of deer.<sup>2</sup>

Canadian cattle were certified brucellosis-free in 1985.<sup>4</sup>

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\* Data included in the epidemiological summary are from January 1, 2013 to December 31, 2017. Data were extracted from Query on February 7, 2018 and therefore are considered preliminary.

*B. canis* is occasionally found in dogs, most often in laboratory dog colonies or kennels, and coyotes have also been found to be infected.<sup>2</sup>

### 4.3 Modes of Transmission

Transmission occurs as a result of direct contact of breaks in the skin and mucous membrane with infected animal tissue, body fluids (blood, urine, vaginal discharges), aborted fetuses and especially placentas, as well as through ingestion of undercooked meat, raw milk and unpasteurized dairy products from infected animals. Airborne inhalation in laboratories and abattoirs has also been reported.<sup>2</sup>

### 4.4 Incubation Period

The incubation period is variable and difficult to ascertain; commonly 1-2 months, with a range of 5 days to 5 months.<sup>2</sup>

### 4.5 Period of Communicability

Person-to-person transmission is rare, but sexual transmission and in utero transmission have been reported. Breastfeeding women may transmit infections to their infants.<sup>1,2</sup>

### 4.6 Host Susceptibility and Resistance

The severity and duration of the illness varies widely and the duration of acquired immunity following infection is uncertain.<sup>2</sup>

## 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>5</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

Preventive Measures:<sup>2</sup>

- Travellers to foreign countries should be advised not to consume unpasteurized dairy products and undercooked meat products;
- If an outbreak is suspected among a particular subset of the population then potentially affected farmers, hunters and animal handlers should be educated

about the proper handling of carcasses. This includes burying the remains and using protective clothing and gloves;

- Protective clothing and gloves should be worn when handling feral swine;
- No one should consume raw unpasteurized milk; and
- Direct contact with body fluids and/or products of parturition from infected animals should be avoided. When products of parturition must be handled, appropriate care should be taken to avoid exposure, and contaminated areas should be disinfected.

## 6.2 Infection Prevention and Control Strategies

For hospitalized cases, routine practices are recommended and contact precautions are indicated when dealing with individuals with draining wounds and or lesions.<sup>1</sup>

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

## 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:

- History of exposure to possible sources based on specific species identified on culture (in past 60 days)
- History of occupational risks
- History of recent travel
- Food history
- Date of symptom onset
- History of past infection, as relapses of prior infection can occur

Notify Canadian Food Inspection Agency (CFIA) if disease is traced to imported or domestic animals/sources. Consider testing suspect food samples or other products. Consult the Public Health Ontario Laboratories advice on testing availability, sampling, and transport considerations. Collaborate with CFIA to ensure proper removal/disposal of implicated product or animal.

Treatment is under the direction of the attending physician and depends on clinical symptoms and age of the case; antibiotics are usually prescribed for six weeks to prevent recurring infection.<sup>1</sup>

## 6.4 Management of Contacts

Investigate contacts, such as co-workers and family members, to identify people who may have been exposed to the same source and who could also be infected.<sup>2</sup>

## 6.5 Management of Outbreaks

Two or more cases linked in time and space is suggestive of an outbreak. If no common source is identified, consideration may be given to a bioterrorism event where there is potential to infect humans and animals through aerosol exposure.

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.

The likelihood of an outbreak of brucellosis is low, given Ontario's brucellosis-free status in cattle; however clusters of cases could possibly occur following exposure to an animal with brucellosis other than cattle, such as deer.

## 7.0 References

1. Committee on Infectious Diseases, American Academy of Pediatrics. Section 3: Summaries of Infectious Diseases: Brucellosis. 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.
2. Heymann DL, editor. Control of Communicable Diseases Manual. 20 ed. Washington, D.C: American Public Health Association; 2015.
3. Scholz HC, Nöckler K, Göllner C, Bahn P, Vergnaud G, Tomaso H, et al. *Brucella inopinata* sp. nov., isolated from a breast implant infection. International journal of systematic and evolutionary microbiology. 2010;60(4):801-8.
4. Canadian Food Inspection Agency. Fact Sheet - Brucellosis [Internet]. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2016 [updated May 2, 2016; cited May 30, 2018]. Available from: <http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/brucellosis/fact-sheet/eng/1305673222206/1305673334337>
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**

<b>Revision Date</b>	<b>Document Section</b>	<b>Description of Revisions</b>
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	Entire section revised.
December 2014	2.2 Outbreak Case Definition	<p>Number two added, “2. The time frame of occurrence”.</p> <p>Number three bullet added, “3. The geographic location(s) or place(s) where cases live or became ill/exposed”.</p> <p>Number four added, “4. Special attributes of cases (e.g., age, underlying conditions and/or aetiologic agent)”.</p>
December 2014	3.1 Clinical Presentation	<p>First sentence removed.</p> <p>New first sentence added, “Acute or insidious onset of symptoms, such as intermittent fever, headache, weakness, profuse sweating, chills, arthralgia, depression, weight loss, and generalized aching.”</p>
December 2014	3.2 Diagnosis	Entire section revised.

Revision Date	Document Section	Description of Revisions
December 2014	4.1 Occurrence	<p>First paragraph, second sentence, “un-reported” replaced with “under-reported”.</p> <p>Second paragraph, second sentence, changed from “Infection is common in those...” to “Infection is more common in those who consume raw caribou, raw milk or raw milk products.”</p> <p>Second paragraph, third sentence, addition of “and <i>B. suis</i> occurring in those with contact with feral swine.”</p> <p>Third paragraph removed.</p> <p>New third paragraph added, “Between 2007 and 2011, an average of three cases of brucellosis were reported per year in Ontario, most of which were related to travel.”</p> <p>Fourth paragraph added, “Please refer to the Public Health Ontario Monthly Infectious Diseases Surveillance Reports and other infectious diseases reports for more information on disease trends in Ontario...”</p>
December 2014	4.3 Modes of Transmission	First sentence, replaced “and their discharges” with “and body fluids”.
December 2014	4.4 Incubation Period	First sentence changed from “The incubation is variable, and difficult to ascertain...” to “The incubation period is usually...”
December 2014	4.5 Period of Communicability	Replaced “communicability” with “transmission”.
December 2014	5.1 To local Board of Health	<p>Changed from “Confirmed and suspected cases shall be reported immediately...” to “Individuals who have or may have brucellosis shall be reported as soon as possible...”</p> <p>Addition of “(HPPA)” to the end of the sentence.</p>



<b>Revision Date</b>	<b>Document Section</b>	<b>Description of Revisions</b>
December 2014	5.2 To Ministry of Health and Long-Term Care (the ministry), or Public Health Ontario (PHO), as specified by the ministry	<p>First paragraph, first sentence, removed “to PHD”.</p> <p>Bullet two, changed from “The disease-specific User Guides published by the ministry” to “iPHIS User Guides published by PHO”.</p> <p>Bullet three, changed from “the ministry” to “PHO”.</p>
December 2014	6.1 Personal Prevention Measures	<p>Bullet two, changed from “Farmers, hunters and animal handlers should...” to “If an outbreak is suspected among a particular subset of the population then potentially affected farmers, hunters and animal handlers should be educated about the proper handling of carcasses. This includes burying the remains and using protective clothing and gloves.”</p> <p>New third bullet added, “Protective clothing and gloves should be worn when handling feral swine”.</p> <p>Previous bullet three moved to bullet four. Bullet four, removed “and milk products from potentially infected cows, goats, and sheep or have direct contact with infected animal body fluids or products of conception”.</p> <p>New fifth bullet added, “Direct contact with body fluids and/or products of parturition from infected animals should be avoided”.</p>
December 2014	6.2 Infection Prevention and Control Strategies	<p>First paragraph, addition of “when dealing with individuals”.</p> <p>Second paragraph added, “Refer to Public Health Ontario’s website at <a href="http://www.publichealthontario.ca">www.publichealthontario.ca</a> to search for the most up-to-date Provincial Infectious Diseases Advisory Committee (PIDAC) best practices on Infection Prevention and Control (IPAC). PIDAC best practice documents can be found at...”</p>

Revision Date	Document Section	Description of Revisions
December 2014	6.3 Management of Cases	<p>First paragraph, second sentence, changed from “The following disease-specific information should also be obtained during case management...” to “In addition to the requirements of HPPA Regulation 569 (Reports), the following disease-specific information should also be obtained”.</p> <p>New fifth bullet added, “Date of symptom onset”.</p> <p>Previous fifth bullet becomes sixth bullet.</p> <p>Second paragraph, first sentence, addition of “/sources”.</p> <p>Second paragraph, second sentence, changed from “Test all suspect food samples” to “Consider testing suspect food samples or other products”.</p> <p>Second paragraph, addition of sentence “Consult the Public Health Ontario Laboratories advice on testing availability, sampling, and transport considerations.”</p> <p>Second paragraph, sentence four, changed from “incriminated product” to “implicated product”.</p>
December 2014	6.5 Management of Outbreaks	<p>Paragraph three, “The occurrence of possible outbreaks of” is replaced with “The likelihood of an outbreak of”.</p> <p>Paragraph three, “occur if exposed to” replaced with “occur following exposure to”.</p>
December 2014	7.0 References	Updated.
December 2014	8.0 Additional Resources	Updated.

<b>Revision Date</b>	<b>Document Section</b>	<b>Description of Revisions</b>
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	4.2 Reservoir	Second paragraph changed from "Ontario has brucellosis free status for cattle" to "Canadian cattle were certified brucellosis-free in 1985".
February 2019	4.5 Period of Communicability	Entire section revised.

