

Appendix A: Disease-Specific Chapters

Chapter: Lyme Disease

Effective: February 2019

Lyme Disease

Communicable

Virulent

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

1.0 Aetiologic Agent

Lyme disease is a tick-borne zoonotic disease caused by the bacterium, *Borrelia burgdorferi* (*B. burgdorferi*), a spirochete first identified in North America in 1982.^{1,2}

2.0 Case Definition

2.1 Surveillance Case Definition

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

2.2 Outbreak Case Definition

Not applicable

3.0 Identification

3.1 Clinical Presentation

Lyme borreliosis is generally divided into three stages in which infected persons may experience any of the following symptoms:

- Early localized disease
 - Erythema migrans (EM) or “bull’s eye” rash at the site of a recent tick bite, fever, malaise, headache, myalgia, neck stiffness, fatigue, lymphadenopathy and arthralgia;
- Early disseminated disease
 - Multiple EM in approximately 15% of people occurs several weeks after infective tick bite, cranial nerve palsies, lymphocytic meningitis, radiculitis, conjunctivitis, arthralgia, myalgia, headache, fatigue, carditis (heart block); and
- Late disease
 - May develop in people with early infection that was undetected or not adequately treated. Involves the heart, nervous system and joints; arrhythmias, heart block and sometimes myopericarditis; recurrent arthritis affecting large joints (i.e., knees); peripheral neuropathy; central nervous system manifestations – meningitis; encephalopathy (i.e., behaviour changes,

sleep disturbance, headaches); ophthalmic conditions such as conjunctivitis, optic neuritis, keratitis, and uveitis; and fatigue.^{1,2}

3.2 Diagnosis

Diagnosis of Lyme disease is primarily based on clinical symptoms and risk factors as assessed by physicians.

Laboratory testing using the two-tier enzyme-linked immuno-sorbent assay (ELISA) and Western Blot criteria (as described by the guidelines of the Canadian Public Health Laboratory Network) is used to support clinical diagnosis of Lyme disease.

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

Lyme disease has been found in Canada, the United States, and parts of Europe and Asia.¹ The first isolation of *B. burgdorferi* from a blacklegged tick in Ontario occurred in 1993, when a tick removed from a dog in Kenora (Northwestern Health Unit) tested positive for the agent of Lyme disease.³ Epidemiologic data for Ontario indicate that infection occurs primarily during the summer months, but may occur throughout the year. Overall, the incidence of Lyme disease in Ontario has increased steadily since 2002.³

The number of confirmed and probable Lyme disease cases in Ontario more than tripled in 2017 (n=987), compared to the five-year (2012–2016) average (n=314). Annual incidence rates have also increased since 2005, with the 2017 provincial rate more than twice that of 2016.⁴

Public Health Ontario (PHO) produces an annual Lyme Disease Estimated Risk Areas map that identifies areas in Ontario where they estimate you are more likely to find blacklegged ticks. The risk increases where there are established or endemic populations of ticks, however it is possible to contract Lyme disease anywhere in Ontario.³ The Lyme Disease Estimated Risk Areas map is available from: <https://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/Pages/IDLandingPages/Lyme-Disease.aspx>

Please refer to PHO's 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

Deer and small mammals such as rodents serve as important hosts to the tick vector, *Ixodes scapularis*, the primary *B. burgdorferi* vector in eastern Canada and Ontario. This tick is commonly known as a deer tick or blacklegged tick.¹ Ixodid ticks become infected as larvae or nymphs when they feed on an infected reservoir host, and they remain infected for life.¹

4.3 Modes of Transmission

Mode of transmission is tick-borne and infection does not occur until an infected tick has been attached for at least 24-36 hours.^{1,3} This is the amount of time required for the bacteria to migrate from the tick's gut to its salivary glands where the bacteria are injected into the host.³ *Borrelia* can potentially be transmitted through blood transfusions, although no such cases have been reported.¹

4.4 Incubation Period

For EM rash, from three to 32 days after tick exposure with a mean of seven to 10 days. Early stages of the illness may not be apparent and the person may present with later manifestations.¹

4.5 Period of Communicability

There is no evidence of person-to-person spread.¹

4.6 Host Susceptibility and Resistance

General susceptibility, with increased risk to those that live in or travel to Lyme disease endemic areas. Reinfection from a subsequent tick bite has occurred in those treated with antibiotics for early-stage disease.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

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 and tucking pants into socks, and using DEET or icaridin insect repellents. The concentration of DEET should be no greater than 30% for adults and no greater than 10% for children;
- Avoiding tick-infested areas when possible; and
- Removing ticks from domestic animals.^{1,6}

6.2 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.

Additional information on Lyme disease management strategies can be found at <https://www.ontario.ca/page/lyme-disease>.

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. Additional disease specific information may include:

- Travel to endemic area and activities in the previous 30 days;
- Outdoor recreational activities and outdoor occupations;
- Symptoms and date of symptom onset and presence or history of EM-like rash; and
- Date of tick bite.

Treatment is under the direction of the attending healthcare provider. Provide education about the infection and how it is acquired.

6.4 Management of Contacts

Not applicable

6.5 Management of Outbreaks

Not applicable

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: Lyme Disease. 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. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Technical report: Update on Lyme disease prevention and control. Second edition. Toronto, ON: Queen’s Printer for Ontario; 2016. Available from: <https://www.publichealthontario.ca/en/diseases-and-conditions/infectious-diseases/vector-borne-zoonotic-diseases/lyme-disease>
4. Lyme Disease and Tick-borne Illnesses Task Force. Report of the Lyme Disease and Tick-Borne Illnesses Task Force. Toronto, ON: Lyme Disease and Tick-borne Illnesses Task Force; 2018. Available from: <http://health.gov.on.ca/en/common/ministry/publications/reports/>
5. Health Protection and Promotion Act, R.S.O. 1990, Reg. 569, Reports, (2018). Available from: <https://www.ontario.ca/laws/regulation/900569>
6. Government of Canada. Prevention of Lyme disease [Internet]. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2015 [updated June 18, 2015; cited August 21, 2018]. Available from: <https://www.canada.ca/en/public-health/services/diseases/lyme-disease/prevention-lyme-disease.html>

8.0 Document History

Table 1: History of Revisions

| Revision Date | Document Section | Description of Revisions |
|---------------|---------------------------|--|
| April 2015 | General | New template. Section 9.0 Document History added. |
| April 2015 | 3.1 Clinical Presentation | Under Late Disease, “significant myocardial dysfunction” replaced with “and sometimes myopericarditis”. Under Late Disease, addition of “and fatigue” at the end of the bullet. |
| April 2015 | 3.2 Diagnosis | Entire section revised. |
| April 2015 | 4.1 Occurrence | Addition of second and third paragraphs. Last paragraph revised. |

| Revision Date | Document Section | Description of Revisions |
|----------------------|---|---|
| April 2015 | 4.3 Modes of Transmission | “Tick-borne: transmission usually does not occur until the tick has been attached for at least 24 hours” revised to “Mode of transmission is tick-borne and infection does not occur until an infected tick has been attached for at least 24 hours.” |
| April 2015 | 4.6 Host Susceptibility and Resistance | Title of Section 4.6 changed from “Susceptibility and Resistance” to “Host Susceptibility and Resistance”. “All persons are probably susceptible, particularly persons that live in or travel to Lyme disease endemic areas” revised to “General susceptibility, with increased risk to those that live in or travel to Lyme disease endemic areas”. |
| April 2015 | 5.1 To Local Board of Health | “Confirmed and suspected cases shall be reported to the medical officer of health...” replaced with “Individuals who have or may have Lyme disease shall be reported as soon as possible to the medical officer of health...” |
| April 2015 | 5.2 To the Ministry of Health and Long-Term Care (the ministry), or Public Health Ontario (PHO), as specified by the ministry | 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”. Deletion of “Report only case classifications specified in the case definition with exposure information to PHD.” Second paragraph, documents that specify the minimum data elements to be reported have been revised. |

| Revision Date | Document Section | Description of Revisions |
|----------------------|---|--|
| April 2015 | 6.2 Infection Prevention and Control Strategies | <p>Deletion of “For more information on vector-borne management strategies refer to the CDC Vector Borne Infections Division...”</p> <p>Addition of “For healthcare settings, conducting routine infection prevention and control strategies is all that is necessary.”</p> <p>Addition of references to the ministry Lyme Disease Surveillance and Management Guidelines and Provincial Infectious Diseases Advisory Committee (PIDAC) best practice on IPAC.</p> |
| April 2015 | 7.0 References | All references updated. |
| April 2015 | 8.0 Additional Resources | All additional resources updated. |
| February 2019 | General | Minor revisions were made to support the regulation change to Diseases of Public Health Significance, references were updated and Section 8.0 Additional Resources was deleted. |

