

Appendix A: Disease-Specific Chapters

Chapter: Cryptosporidiosis

Effective: February 2019

Cryptosporidiosis

Communicable

Virulent

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

1.0 Aetiologic Agent

Cryptosporidium are oocyst-forming coccidian protozoa. Oocysts are excreted in feces of an infected host. The most common species causing disease in humans are *C. hominis*, which only infects humans, and *C. parvum*, which infects humans, cattle and other mammals.¹

Oocysts may survive for 2 to 6 months in a moist environment.² *Cryptosporidium* is resistant to most disinfectants including 3% hypochlorite, iodophors, and 5% formaldehyde and can survive for days in treated recreational water venues.^{3,4}

The infectious dose is low; studies have demonstrated that the ingestion of ≤ 10 *C. hominis* or *C. parvum* oocysts can cause infection in healthy persons.⁵

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

Cryptosporidiosis is a parasitic infection that commonly presents as gastroenteritis. The major symptom is diarrhea, which may be watery and profuse and is associated with cramping and abdominal pain. In children, the diarrhea is often preceded by anorexia

and vomiting. General malaise, fever, anorexia, nausea and vomiting occur less often. Symptoms often wax and wane but remit in less than 30 days in most immunologically healthy people. Asymptomatic infections are common and constitute a source of infection for others.^{2,6}

Cryptosporidiosis in immunocompromised individuals may lead to more severe clinical manifestations such as pancreatitis and liver cirrhosis.⁴

In immunocompromised persons, especially those infected with HIV, who may be unable to clear the parasite, the disease has a prolonged and fulminant clinical course contributing to death. Patients with AIDS who have cryptosporidiosis have a wide spectrum of disease depending on the site of infection and the CD4+ T-cell count. Among the immunocompromised (e.g., those who are HIV positive or have AIDS), symptoms can also relapse.^{5,6}

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

Worldwide. Outbreaks have been associated with exposure to recreational water (e.g., splash parks, wave pools, and swimming pools), lakes, and with drinking unfiltered water and contaminated beverages.² Outbreaks have occurred in childcare settings, correctional facilities, and drinking water.^{2,7} In Ontario, cases of cryptosporidiosis tend to increase during the summer and early fall. Exposure to recreational water is often associated with cryptosporidiosis outbreaks in Ontario.

Between 2013 and 2017, an average of 373 cases of cryptosporidiosis were reported per year in Ontario.*

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.

* 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.

4.2 Reservoir

Humans, cattle and other domesticated and feral animals.²

4.3 Modes of Transmission

Fecal-oral, which includes person-to-person, animal-to-person, waterborne (recreational or drinking water) and foodborne transmission.²

4.4 Incubation Period

Variable; 1 to 12 days is the likely range with an average of about 7 days.²

4.5 Period of Communicability

Oocysts, the infectious components of the parasites life cycle, appear in stool at the onset of symptoms and are infectious immediately upon excretion; duration of post-symptomatic oocyst excretion varies from several weeks to months.^{1,2} The duration of oocyst infectiousness in the environment under suitable soil conditions can range from 2 to 6 months.²

Symptoms can last for 30 days or less in healthy hosts, or longer in immunocompromised.² Mean duration has been reported as 12.7 days or up to a month in healthy adults, relapse/recurrence can occur after an asymptomatic period.^{5,8} Among the immunocompromised (e.g., those who are HIV positive or have AIDS), symptoms can be chronic/relapsing.^{5,6}

4.6 Host Susceptibility and Resistance

Persons with intact immune function usually have asymptomatic or self-limiting illness. It has been estimated that 10 to 20% of AIDS patients develop infection at some time during their illness.²

Those who are particularly prone to infection include children under two, animal handlers, travelers, men who have sex with men and close personal contacts of infected individuals (family, healthcare and daycare workers).²

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);⁹
- 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

Practice proper hand hygiene after using sanitary facilities, toileting and diapering, handling pets/livestock and before and after handling food.

Consume Safe Drinking Water

Where water might be contaminated, travelers, campers and hikers should be advised of methods to make water safe for drinking.

- Water should be brought to a full boil for one minute.²
- Filters designed to remove *Cryptosporidium* oocysts should be used.¹⁰
- Oocysts are resistant to chlorine.¹

Recreational Water Use

- Avoid using public recreational waters such as swimming pools and splash pads for 2 weeks after symptoms have resolved.¹
- Babies and toddlers should wear special swim diapers or pants when using public recreational waters.

Food Safety

- Use potable water to wash or rinse fresh fruit and vegetables before consumption.¹¹
- Thoroughly cook and reheat all food derived from animal sources to the appropriate temperatures. For temperatures, see the ministry's 'Food Safety: Cook' publication available at:
<http://www.health.gov.on.ca/en/public/programs/publichealth/foodsafety/cook.aspx#4>.
- Consume only pasteurized milk and dairy products.¹²

6.2 Infection Prevention and Control Strategies

- A safe water supply is of primary importance.
- Educate the public about hand hygiene, washing produce, and the risks involved with sexual contact.
- Routine and contact practices are recommended for incontinent and/or diapered hospitalized/institutionalized cases.¹
- Increased public awareness of acceptable practices at swimming venues can help avoid acquiring or transmitting the disease.
- Recreational water operators should be effectively trained in procedures for the management of fecal accidents and in proper filtration methodology.¹³
- Where recreational water (e.g., pool, spa, hot tub, wave pool, splash pad, water park) is determined to be the confirmed or suspect source of cryptosporidiosis, boards of health should refer to the *Recreational Water Protocol, 2018* (or as current). Operators may be advised to take action, including, but not limited to, closing the premises to the public and performing hyperchlorination.¹⁴

Refer to PHO's website at 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.

Exclude food handlers, healthcare workers, daycare staff and attendees who are symptomatic until 24 hours after cessation of symptoms.²

Provide education about the illness and how to prevent spread, emphasizing strict hand hygiene.

There is no specific treatment except rehydration when indicated.²

6.4 Management of Contacts

Investigate household and close contacts who may have shared a common source exposure (e.g., water supply, food, etc.).

Symptomatic contacts that are food handlers, healthcare workers, daycare staff and attendees should be assessed by their healthcare provider to determine if infected, and should be excluded as above.

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.

An outbreak is defined as the occurrence of two or more cases of enteric illness linked by time, common exposure, or source, and most often location.

Refer to Ontario's Foodborne Illness Outbreak Response Protocol (ON-FIORP) 2013 (or as current) for multi-jurisdictional foodborne outbreaks which require the response of more than two Parties (as defined in ON-FIORP) to carry out an investigation.

7.0 References

1. Committee on Infectious Diseases, American Academy of Pediatrics. Section 3: Summaries of Infectious Diseases: Cryptosporidiosis. 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. Centers for Disease Control and Prevention. Cryptosporidiosis Outbreaks Associated with Recreational Water Use --- Five States, 2006. Morbidity and Mortality Weekly Report. 2007;56(29):729-32.
4. Public Health Agency of Canada. Pathogen Safety Data Sheets: Infectious Substances – Cryptosporidium parvum [Internet]. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2011 [updated December 2011; cited February 13, 2018]. Available from: <https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/cryptosporidium-parvum-pathogen-safety-data-sheet.html>
5. Yoder JS, Wallace RM, Collier SA, Beach MJ, Hlavsa MC. Cryptosporidiosis surveillance—United States, 2009–2010. Morbidity and Mortality Weekly Report: Surveillance Summaries. 2012;61(5):1-12.
6. Davies A, Chalmers R. Cryptosporidiosis. BMJ. 2009;339(b4168).
7. Greig J, Lee M, Harris J. Review of enteric outbreaks in prisons: effective infection control interventions. Public Health. 2011;125(4):222-8.
8. Hunter PR, Hughes S, Woodhouse S, Syed Q, Verlander NQ, Chalmers RM, et al. Sporadic cryptosporidiosis case-control study with genotyping. Emerging infectious diseases. 2004;10(7):1241.
9. Health Protection and Promotion Act, R.S.O. 1990, Reg. 569, Reports, (2018). Available from: <https://www.ontario.ca/laws/regulation/900569>
10. Centers for Disease Control and Prevention. Parasites - Cryptosporidium (also known as "Crypto"): A Guide to Water Filters [Internet]. Atlanta, GA: U.S. Department of Health & Human Services; 2015 [updated April 3, 2015; cited February 13, 2018]. Available from: https://www.cdc.gov/parasites/crypto/gen_info/filters.html
11. Centers for Disease Control and Prevention. Parasites - Cryptosporidium (also known as "Crypto"): Prevention & Control - General Public [Internet]. Atlanta, GA: U.S. Department of Health & Human Services; 2015 [updated October 7, 2015; cited February 13, 2018]. Available from: https://www.cdc.gov/parasites/crypto/gen_info/prevention-general-public.html
12. Minnesota Department of Health. Preventing Cryptosporidiosis [Internet]. St. Paul, MN: Minnesota Department of Health; 2017 [updated December 27, 2017]. Available from: <http://www.health.state.mn.us/divs/idepc/diseases/cryptosporidiosis/prevention.html>
13. Centers for Disease Control and Prevention. Fecal Incident Response Recommendations for Aquatic Staff. Atlanta, GA: U.S. Department of Health and Human Services; 2016. Available from: <https://www.cdc.gov/healthywater/swimming/aquatics-professionals/fecalresponse.html>

14. Ontario. Ministry of Health and Long-Term Care. Recreational Water Protocol, 2018. Toronto, ON: Queen's Printer of Ontario; 2018. Available from: http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/protocolsguidelines.aspx

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	1.0 Aetiologic Agent	Entire section revised.
April 2015	2.2 Outbreak Case Definition	Changed “The outbreak case definition varies with the outbreak under investigation” to “Outbreak case definitions are established to reflect the disease and circumstances of the outbreak under investigation. Confirmed outbreak cases must at a minimum meet the criteria specified for the provincial surveillance confirmed case classification.” Removed “or aetiologic agent” from “Special attributes of cases (e.g. age, underlying conditions) and/or aetiologic agent”
April 2015	3.1 Clinical Presentation	Entire section revised.
April 2015	3.2 Diagnosis	Revised to include URL for the Public Health Ontario Laboratory Services website.
April 2015	4.1 Occurrence	Revised and updated with additional information on number of cases reported and reference to PHO monthly infectious diseases surveillance reports website.
April 2015	4.2 Reservoir	Revised to include “other domesticated and feral animals”.
April 2015	4.3 Modes of Transmission	Entire section revised.
April 2015	4.5 Period of Communicability	Entire section revised.

Revision Date	Document Section	Description of Revisions
April 2015	4.6 Host Susceptibility and Resistance	Added "Host" to title. Added: "Those who are particularly prone to infection include children under two, animal handlers, travelers, men who have sex with men and close personal contacts of infected individuals (family, healthcare and daycare workers)."
April 2015	5.1 To local Board of Health	Entire section revised.
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 revised from "To Public Health Division". Revised the list of sources that include the minimum data elements to be reported.
April 2015	6.1 Personal Prevention Measures	Revised and updated to include specific sections for: Consume Safe Drinking Water; Recreational Water Use; and Food Safety.
April 2015	6.2 Infection Prevention and Control Strategies	Entire section revised.
April 2015	6.3 Management of Cases	Removed: "More detailed information on exclusion is available in the resource "Guidelines for the Management of Enteric Diseases in Healthcare Workers, Food Handlers and Daycare Staff and Attendees"."
April 2015	6.4 Management of Contacts	First Sentence: Added "and close" and "(e.g., water supply, food, etc.)" to "Investigate household and close contacts who may have shared a common source exposure (e.g., water supply, food, etc.)"

Revision Date	Document Section	Description of Revisions
April 2015	6.5 Management of Outbreaks	Added: "Refer to Ontario's Foodborne Illness Outbreak Response Protocol (ON-FIORP) for multi-jurisdictional foodborne outbreaks which require the response of more than two Parties (as defined in ON-FIORP) to carry out an investigation".
April 2015	7.0 References	Updated.
April 2015	8.0 Additional Resources	Updated.
February 2019	General	Minor revisions were made to support the regulation change to Diseases of Public Health Significance, Cryptosporidiosis 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.
February 2019	3.1 Clinical Presentation	Added sentence, "Cryptosporidiosis in immunocompromised individuals may lead to more severe clinical manifestations such as pancreatitis and liver cirrhosis." Removed sentence, "This parasite can also cause extraintestinal complications involving the gallbladder, biliary tree, and pancreatic ducts."
February 2019	4.5 Period of communicability	First sentence, duration of post-symptomatic oocyst excretion endpoint updated from 60 days to months.

