

Appendix A: Disease-Specific Chapters

Chapter: Verotoxin-producing *E. coli* infection indicator
conditions, including Hemolytic Uremic Syndrome (HUS)

Revised March 2017

Verotoxin-producing *E. coli* infection indicator conditions, including Hemolytic Uremic Syndrome (HUS)

☒ Communicable

☐ Virulent

Health Protection and Promotion Act:

Ontario Regulation 558/91 – Specification of Communicable Diseases

Health Protection and Promotion Act:

Ontario Regulation 559/91 – Specification of Reportable Diseases

1.0 Aetiologic Agent

Verotoxin-producing *Escherichia coli* (VTEC), also known as Shiga toxin-producing *E. coli* (STEC), is a highly pathogenic subtype of *E. coli*. VTEC are distinguished from other *E. coli* by the ability to produce Shiga toxins (also referred to as verotoxins), or by the presence of genes encoding those toxins.¹⁻³

E. coli O157:H7 is most commonly associated with infection in humans. However, the clinical relevance of non-O157 subtypes of VTEC have been increasingly recognized.¹

2.0 Case Definition

2.1 Surveillance Case Definition

[See Appendix B](#)

2.2 Outbreak Case Definition

The outbreak case definition varies with the outbreak under investigation. For example, confirmed outbreak cases should at a minimum meet the criteria specified for the provincial surveillance confirmed case classification. Consideration should be given to the following when establishing an outbreak case definition:

- Clinical and/or epidemiological criteria;
- The time frame of occurrence;
- The geographic location(s) or place(s) where cases live or became ill/exposed;
- Special attributes of cases (e.g. age, underlying conditions); and
- Further typing (e.g. pulsed field gel electrophoresis (PFGE), multi locus variable number tandem repeat analysis (MLVA)) as appropriate, which may be used to support linkage.

Cases may be classified by levels of probability (i.e. confirmed probable, and/or suspect).

3.0 Identification

3.1 Clinical Presentation

Self-limiting enteric disease in infants and adults; characterized by bloody or non-bloody diarrhea, abdominal cramping, vomiting, acidosis, prostration, malaise and dehydration; fever is not present in most cases and symptoms usually last fewer than five days.⁴ Mild and asymptomatic infections may also occur.

Most individuals recover without residual sequelae, however, complications such as hemorrhagic colitis and Hemolytic Uremic Syndrome (HUS) can occur. HUS occurs in about 8% of infected children as well as in a small number of adults, particularly the elderly.⁴

3.2 Diagnosis

[See Appendix B](#) for diagnostic criteria relevant to the Case Definition.

Routine screening for non-O157 VTEC is not routinely performed in most laboratories. This testing can be performed at the Public Health Ontario Laboratories if specifically requested.

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

In Ontario, VTEC cases demonstrate seasonal increases in the summer months.

Between 2007 and 2011, an average of 229 cases of VTEC were reported per year in Ontario.

Please refer to the Public Health Ontario (PHO) Monthly Infectious Diseases Surveillance Reports and other infectious diseases reports for more information on disease trends in Ontario.^{5, 6}

<http://www.publichealthontario.ca/en/DataAndAnalytics/Pages/DataReports.aspx>

4.2 Reservoir

The most important reservoir is infected dairy and beef cattle, but other animals such as sheep, pigs and goats can also be infected. Humans may serve as a reservoir for person-to-person spread.¹

4.3 Modes of Transmission

Transmitted by the fecal-oral route mainly by ingestion of contaminated food. Ground beef is a common source of infection but other known sources include fermented meats, fresh produce (such as lettuce, spinach, coleslaw, sprouts and melons) and unpasteurized milk and beverages (such as apple cider and orange juice).

Waterborne transmission can occur through the ingestion of contaminated drinking water or recreational water.

Animal to person transmission can occur at farms and petting zoos.⁷

Person-to-person transmission most frequently occurs in settings (e.g., day nurseries) where personal hygiene practices are inadequate.

4.4 Incubation Period

2 – 10 days with a median of 3 – 4 days.¹ HUS typically develops 7 days (up to 3 weeks) after onset of diarrhea.³

4.5 Period of Communicability

Variable, as long as organisms are excreted; the duration of excretion of the pathogen is typically 1 week or less in adults but can be 3 weeks in one third of children. Prolonged carriage is uncommon.¹

4.6 Host Susceptibility and Resistance

The infectious dose is very low.¹ Little is known about differences in susceptibility and immunity, but infections occur in all ages. Children under five years are most frequently diagnosed with infection and are at greatest risk of developing HUS. The elderly also appear to be at increased risk of complications.¹

5.0 Reporting Requirements

5.1 To local Board of Health

Individuals who have or may have VTEC, including non-O157 VTEC, shall be reported as soon as possible to the medical officer of health by persons required to do so under the *Health Protection and Promotion Act*, R.S.O. 1990 (HPPA).⁸

5.2 To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry

Cases shall be reported using the integrated Public Health Information System (iPHIS), or any other method specified by the ministry **within one (1) business day of receipt of initial notification** as per iPHIS Bulletin Number 17: Timely Entry of Cases.⁹

The minimum data elements to be reported for each case are specified in the following sources:

- *Ontario Regulation 569 (Reports)* under the (HPPA),^{10, 8}
- 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

Food Handling:

- Minimize cross contamination through the use of safe food handling techniques
- Practice proper hand hygiene after using sanitary facilities, handling raw foods and farm animals (petting zoos) and before handling food
- Thoroughly cook all food derived from animal sources, especially ground beef
- Treat or boil water intended for consumption
- Conduct routine bacteriological analysis of private drinking water supplies
- Consume only pasteurized juices, milk and dairy products
- Wash fresh fruits and vegetables under potable running water

For more food safety prevention measures, please see the ministry's food safety frequently asked questions available from

<http://www.health.gov.on.ca/en/public/programs/publichealth/foodsafety/faq.aspx>

6.2 Infection Prevention and Control Strategies

Routine and contact practices are recommended for incontinent and diapered cases for hospitalized cases.

Refer to Public Health Ontario's website at www.publichealthontario.ca 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:

http://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/PIDAC/Pages/PIDAC_Documents.aspx.

6.3 Management of Cases

Investigate cases of VTEC to determine the source of infection. Refer to Section 5: Reporting Requirements above for relevant data to be collected during case investigation. In addition to the requirements of HPPA Regulation 569 (Reports),^{10, 8} the following disease-specific information should also be obtained during the incubation period:

- Food, water and other exposure histories such as animal contact in the 10 days prior to symptom onset
- Contact with a known case or person with symptoms compatible with *E. coli* in the 10 days prior to symptom onset
- History of occupation involving susceptible populations, food handling, childcare and healthcare

Education

Provide education about disease transmission, appropriate personal hygiene and food handling practices.³

Advise the case against attending swimming pools, hot tubs or water spray parks until 48 hours after their symptoms have resolved.¹¹

Treatment

Use of antibiotics is not recommended. Treatment of VTEC is largely supportive and may require hospital admission.¹²

Exclusion

Exclude symptomatic food handlers, healthcare providers, and day care staff and attendees until the provision of 2 consecutive negative stool specimens or rectal swabs taken at least 24 hours apart^{1, 11} and at least 48 hours after the completion of antibiotic and/or anti-diarrheal therapy medications, if these medications have been used.

* If the healthcare setting is a hospital, use the “Enteric Diseases Surveillance Protocol for Ontario Hospitals” (OHA and OMA Joint Communicable Diseases Surveillance Protocols Committee, revised December 2015, or as current) for exclusion criteria.
<http://www.oha.com/Services/HealthSafety/Pages/CommunicableDiseasesSurveillanceProtocols.aspx>

Special Considerations

- The medical officer of health or designate may modify this requirement to permit food handlers and healthcare workers with good personal hygiene to return to work without specimen submission. In this instance, the case should, at a minimum, be symptom free for at least 24 hours.
- Exclude asymptomatic culture positive children and childcare providers from child care settings until the provision of 2 negative stool specimens or rectal swabs

collected at least 24 hours apart or 48 hours following the completion of anti-diarrheal or antibiotic therapy.

6.4 Management of Contacts

Contacts include household members, or other persons who have had close contact with the case or shared the suspected exposure.

Contacts should be instructed about disease transmission, appropriate personal hygiene and contact precautions when providing care for diapered or incontinent cases.

Assess household and other contacts for symptoms and if symptomatic advise to seek medical care. Management and exclusion of symptomatic contacts is the same as for cases.

Special Consideration for Day Nurseries

If a case is identified in a day nursery setting, and the source is unknown, consider submission of at least one stool specimen or rectal swabs from children in the same classroom, regardless of symptom history. Counsel both parents and staff regarding symptom presentation and asymptomatic carriage in children.^{13, 14}

6.5 Management of Outbreaks

Provide public health management of outbreaks or clusters in order to identify the source of illness, stop the outbreak and limit secondary spread.

Two or more cases linked in time and place to a common exposure is suggestive of an outbreak

As per this Protocol, outbreak management shall be comprised of, but not limited to, the following general steps:

- Confirm diagnosis and verify the outbreak;
- Establish an outbreak team;
- Develop an outbreak case definition. These definitions should be reviewed during the course of the outbreak, and modified if necessary, to ensure that the majority of cases are captured by the definitions;
- Implement prevention and control measures;
- Implement and tailor communication and notification plans depending on the scope of the outbreak;
- Conduct epidemiological analysis on data collected;
- Conduct environmental inspections of implicated premise where applicable;
- Coordinate and collect appropriate clinical specimens where applicable;
- Prepare a written report; and

- Declare the outbreak over in collaboration with the outbreak team.

For more information regarding specimen collection and testing, please refer to the **Public Health Inspector's Guide to the Principles and Practices of Environmental Microbiology**: <https://www.publichealthontario.ca/en/About/Newsroom/Pages/New-Public-Health-Inspectors-Guide-Released.aspx>

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.

<http://health.gov.on.ca/en/pro/programs/publichealth/enviro/>

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8.0 Additional Resources

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9.0 Document History

Table 1: History of Revisions

| Revision Date | Document Section | Description of Revisions |
|---------------|-------------------------|--|
| March 2017 | General | New Template |
| March 2017 | 6.3 Management of Cases | "Enteric Diseases Surveillance Protocol for Ontario Hospitals" reference updated |
| March 2017 | 7.0 References | Updated |
| March 2017 | 9.0 Document History | Updated |

