

Verotoxigenic *E. Coli* (VTEC) Infection (Enterohemorrhagic *E. Coli* Infection)



Case Definition

Confirmed case: Verotoxin-producing *E. coli* (including *E. coli* O157:H7) identified from stool specimens.

Clinical case: Clinically compatible illness (liquid or bloody diarrhea) in a contact of a confirmed case.

Reporting Requirements

- All positive stool cultures for *E. coli* O157 or other verotoxin-producing *E. coli* are reportable by laboratory.
- All cases of VTEC are reportable by attending health care professional.
- Cases of hemolytic-uremic syndrome (HUS), whether or not associated with VTEC, are reportable by attending health care professional.

Clinical Presentation/Natural History

Acute diarrhea, often bloody, with abdominal pain. Vomiting is common. Fever may occur but is usually absent. Up to 15% of cases may be associated with hemolytic-uremic syndrome (renal failure associated with hemolysis of red blood cells) or thrombotic thrombocytopenic purpura (TTP: hemolytic anemia with thrombocytopenia). Disease complications are most common in children under 14 years of age and the elderly. However, the overall case-fatality rate is less than 1%.

Etiology

Escherichia coli O157:H7 is the Gram-negative bacterium serotype most often associated with production of verotoxin, the toxin responsible for the disease, although other serotypes such as O26:H11, O111:H8 and O104:H21 have been implicated. At least two different types of verotoxin have been identified; the complication rate depends on which of the verotoxins is being produced.

Epidemiology

Reservoir: The major reservoir is domestic cattle. It has been isolated from unpasteurized milk.

Transmission: Most infections are foodborne, resulting from inadequate cooking of contaminated food, or cross-contamination during food preparation. Undercooked hamburger, apple cider, alfalfa sprouts and raw milk have been implicated in sporadic and epidemic cases. Secondary fecal/oral spread may occur where personal hygiene is lacking, such as in day care facilities with diapered children, nurseries, kindergartens and in nursing homes. In rare instances, transmission can occur through contaminated water.

Occurrence:

General: The first VTEC outbreak was reported in the United States in 1982. Since then, sporadic cases and outbreaks have been reported in Canada, the United States and Britain. All age ranges are susceptible; highest age-specific incidence rates occur in children less than 15 years of age.

Manitoba: The majority of cases have occurred between June and September, with peak occurrence in July and August. Seventy-seven cases of VTEC were reported in 1999 (6.7 per 100,000). Highest age-specific incidence rates were in children less than 15 years of age.

Incubation Period: Median of three to four days, with a range of two to eight days.

Susceptibility and Resistance: The infectious dose is very low. Little is known about differences in susceptibility and immunity. Children less than five years of age are at greatest risk of developing the hemolytic-uremic syndrome.

Period of Communicability: The majority of adults have negative stool cultures within one week of the onset of symptoms, and transmission by asymptomatic carriers is rare. Transmission can

occur for up to three weeks in children. Prolonged carriage is rare.

Diagnosis

Stool culture for *E. coli* O157 or other verotoxin-producing *E. coli*. Stool samples may be found to contain free verotoxin by the Cadham Provincial Laboratory before the stool is cultured, either by a direct method or the “PECS” method. The organism producing verotoxin may turn out to be an *E. coli* other than *E. coli* O157. For purposes of disease control, however, cases with the clinical symptoms described above and stool positive for free verotoxin should be reported and followed up in the same manner as cases in which *E. coli* O157 has been isolated.

The diagnosis should be considered with clinical cases of severe diarrhea, HUS or TTP. Most laboratories in Manitoba now screen diarrheal stools for *E. coli* O157, and free verotoxin can be detected from stool specimens. Stool cultures should also be submitted from cases of HUS and TTP, since the majority of these occur in association with infection with verotoxin-producing organisms.

Key Investigations

- History of ingestion of potentially contaminated food and time of consumption.
- Screening of contacts, as indicated below.
- Stool specimens should be sent for laboratory testing.

Control

Management of Cases:

- Rehydration, supportive care and management of complications. The value of antibiotics in treatment has not been established. Use (particularly sulfonamides) may prolong illness and increase the risk of complications.
- Routine practices and contact precautions (if feces not contained or environmental soiling) during acute illness. Food handlers and personal care givers may return to work once symptoms

have stopped, if personal hygiene is adequate. Children attending day care should be excluded from the facility until they are asymptomatic and have had at least three negative stool cultures.

Management of Contacts:

- **Food handlers and health care workers:** If symptomatic, exclude from food handling or patient/resident care. Culturing of asymptomatic persons is not recommended unless there is suspicion of institutional or day care centre transmission.
- **Institutional contacts:** Where the index case is a resident or staff member in a hospital or personal care home, an outbreak investigation must be carried out immediately. The protocol for investigation of foodborne outbreaks may be used. It must be determined whether a common source outbreak has occurred, and immediate measures taken to identify and isolate persons who may be transmitting the infection.
- **Day care facilities:** Person-to-person transmission of VTEC is facilitated in the day care setting, and attenders are in the age group where complications are frequent. See below for management of outbreaks.

Management of Environment:

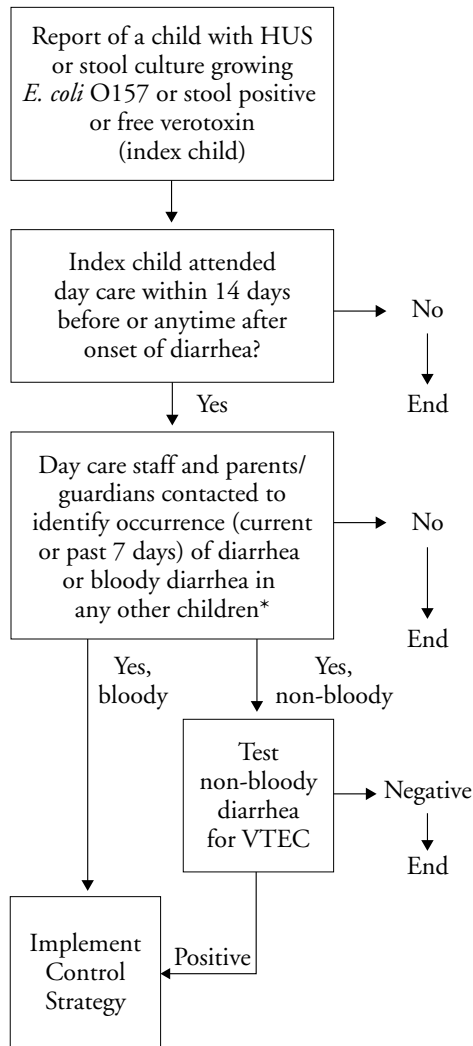
- Pasteurization of milk and juices.
- Sanitary production, processing, retailing, handling and serving of meat.
- Protect water sources from surface contamination. Chlorinate public water supplies.
- Chlorinate swimming pools.

Management of Outbreaks:

- Health care facilities should follow established outbreak management protocols for enteric infections.
- The protocol below is based on the one developed by the Minnesota Department of Health in response to outbreaks of VTEC in day care facilities. It should be initiated when a case of *E. coli* O157 infection, or HUS, or stool positive for free verotoxin is identified in a child who attends day care.

Communicable Disease Management Protocol

Evaluation of a day care facility where VTEC infection is confirmed or suspected



* See Sample Letter A that follows.

Transmission may be suspected in other circumstances: for example, diarrhea in siblings and parents of children attending day care, or in day care staff.

Control Strategy:

- The Medical Officer of Health or designate should meet with the day care administration to review the cases and discuss control measures.

- Stool cultures should be obtained from all children who attended the day care during the time period beginning four weeks before onset of illness in the index child and up to the outbreak investigation. Stool collection and transportation should be coordinated by the local public health jurisdiction, with assistance from the provincial laboratory as required.
- Preschool-aged children should be prohibited from attending any day care until both:
 - the child has no gastrointestinal illness; and
 - at least one negative stool culture is obtained.
- Children with positive stool specimens should continue to be excluded, even if asymptomatic, until a negative specimen is obtained.
- A letter providing general information on *E. coli* O157 transmission and specific instructions regarding stool collection procedures and criteria for re-entry into day care should be sent to all families when the investigation is initiated. See Sample Letter B that follows.
- The Medical Officer of Health should review clinical and stool culture reports and monitor re-entry to day care. The local public health jurisdiction should collect and analyse data from the outbreak investigation.

Preventive Measures:

- Thorough cooking of all food derived from animal sources, especially ground beef. Cook to an internal temperature of 68°C for at least 15 seconds.
- Education of food handlers in proper food handling and hygiene, especially in avoiding cross-contamination from raw meat products, and thorough handwashing.
- Public education regarding the risks associated with the consumption of raw or undercooked meat, especially ground beef.
- Exclusive breastfeeding (i.e., no provision of complementary foods) may be protective among infants under age four to six months.
- Ensure adequate hygiene in child care centres, especially frequent handwashing with soap and water.

Sample Letter A: Identification of other cases of diarrhea in a day-care centre after an index case has been identified (before a Control Strategy has been implemented)

Dear Parent or Guardian:

Regarding: Diarrhea due to *E.coli* O157 in your child's day-care centre

Your public health unit is investigating the occurrence of diarrhea in your child's day-care centre. Another child has been diagnosed with a type of diarrhea caused by *E. coli* O157, commonly known as "hamburger disease."

This infection causes diarrhea, often containing blood, with stomach cramps. In some children it may cause severe complications affecting the kidneys and blood system. It is most commonly caused by eating undercooked hamburger meat, but may also be spread from person to person, particularly among small children. Infected children can excrete the bacteria in their stool. Contamination of their hands with stool can allow the bacteria to spread when the children handle toys and play together.

Person-to-person spread of *E. coli* bacteria is common in preschool children attending day-care centres. For this reason, we would like to make you aware of the occurrence of this infection in your child's day-care centre. If your child develops diarrhea during the next two weeks or has been ill with diarrhea in the past 3 weeks, please contact your local public health unit:

Public Health Nurse: _____

Phone: _____

Address: _____

Careful handwashing is the key to prevent the spread of this infection from person to person.

Please do not hesitate to contact us if you have any questions or information.

Yours truly,

Medical Officer of Health

Sample Letter B: Notification of parents/guardians after a Control Strategy has been implemented in a day-care centre

Dear Parent or Guardian:

Regarding: Diarrhea due to *E. coli* O157 in your child's day-care centre

Your public health unit is investigating the occurrence of (diarrhea and /or hemolytic uremic syndrome) in the day-care (home) that your child attends. A specific type of bacteria has been found in the stool of a child in the day-care (home). These bacteria often cause diarrhea with stomach cramps; blood may also be present in the stool. In some children a more severe complication known as HUS (hemolytic uremic syndrome) may occur. This complication includes kidney failure and anemia, and often results in prolonged hospitalization. Fortunately, most children do not develop HUS and recover completely from their diarrhea.

The *E. coli* O157 bacteria may be present in raw meat (especially hamburger) and unpasteurized milk. Eating meat that is not thoroughly cooked can lead to infection. Also, the bacteria can be spread from one person to another, particularly among small children. Infected children can excrete the bacteria in their stool, and contamination of their hands with stool can allow the bacteria to spread when the children handle toys and play together. For this reason, these bacteria can spread to other children in a day-care centre.

Because these bacteria can cause a serious complication such as HUS, it is necessary to determine immediately whether or not the infection is being spread in the day-care (home). Therefore, the public health unit staff will be asking you a series of questions about diarrhea in your family. As it appears that more than one child in the day-care (home) has been infected, it will be necessary to exclude all children from the day-care until each child has had a stool specimen that tests negative for the bacteria. It is essential that no children attend ANY day-care centre until a negative stool culture has been obtained, since this could allow the bacteria to spread to uninfected children, with the risk that they will develop HUS. This is likely to be inconvenient, but it is the only way to ensure the safety of the children in your day-care centre and other centres.

Older children (i.e., those in school) who attend the day-care (home) before or after school have a lower risk of serious infection with this bacteria. These children do not need to be excluded from school or after-hours day-care, but stool cultures will be tested for the bacteria.

The investigation of this infection is being coordinated by your local public health unit. You will be assisted in collection of the stool samples, and can direct any questions to:

Public Health Nurse: _____

Phone: _____

Address: _____

Yours truly,

Medical Officer of Health