SHIGA TOXIN-PRODUCING ESCHERICHIA COLI (STEC)

Disease Overview

Many strains of *Escherichia coli* bacteria normally inhabit the intestines of humans and animals. Each strain varies in its epidemiology, pathogenesis, and clinical syndromes. Most strains of *E. coli* are harmless; however, some are verotoxigenic and cause severe disease. The most serious are the strains that produce shiga toxins including E. *coli* O157:H7. The shiga toxin E coli (STEC) strains are also referred to as verocytotoxin-producing *E. coli* (VTEC) or enterohemorrhagic *E. coli* (EHEC).

Symptoms

Asymptomatic infections can occur. Symptomatic infections are characterized by mild to severe diarrhea, often accompanied with abdominal cramps, bloody stool and severe abdominal pain, often without fever. The most severe clinical manifestation is hemolytic uremic syndrome (HUS) with accompanying renal failure. Death may occur. The organism may also cause extra-intestinal infections.

Reservoir

Animals, most frequently cattle and sheep, goats, and deer.

Mode of Transmission

Fecal-oral transmission. Common source outbreaks are related to consumption of food contaminated with fecal material (usually cattle). Outbreaks have been traced to food sources such as:

- beef (usually inadequately cooked hamburgers or foods contaminated with raw and undercooked meat juices)
- grocery produce (including melons, lettuce, fresh spinach, coleslaw, apple cider, alfalfa sprouts) that have been contaminated with manure.
- unpasteurized milk and unpasteurized apple cider.

Fecal contamination of non-treated water can also be a source of infection, both drinking water and swimming/bathing in recreational waters.

Person-to-person transmission (secondary fecal-oral transmission from infected cases) occurs most often in settings where close contact is common such as families, childcare centers, and custodial institutions.

Direct contact with infected farm animals and farm environment (soil and water contaminated by animal feces) can lead to infection.

Incubation Period

Average is 3-4 days (range 2-10 days).

Period of Communicability

Throughout the course of the infection, approximately one week in adults and for up to 3 weeks in children.

Risk Factors

Not applicable

Surveillance Case Definition

Confirmed case

Laboratory confirmation of infection with or without clinical illness:

- Isolation of Shiga toxin-producing *Escherichia coli* from an appropriate clinical specimen (e.g., stool, blood, urine);

OR

- Detection of Shiga toxin antigen or nucleic acid in an appropriate clinical specimen (dependent on the test used) using a culture independent diagnostic test (CIDT), such as a nucleic acid test (NAT), or polymerase chain reaction (PCR).

Probable case

Clinical illness in a person who is epidemiologically linked to a confirmed case, which would include persons with hemolytic uremic syndrome (HUS).

OR

Detection of *E. coli* O157 nucleic acid that is Shiga toxin negative or pending, with or without clinical illness, in an appropriate clinical specimen (i.e., dependent on the test used) using a NAT, such as a PCR.

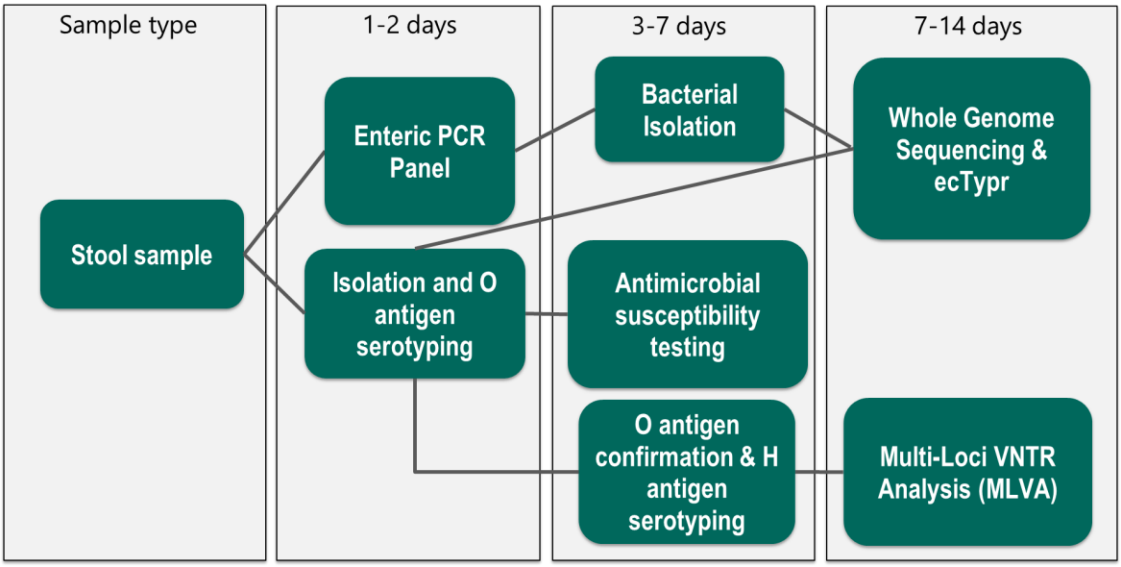
Diagnosis and Laboratory Testing Guidelines

Isolation of organisms, usually from stool sample (see Food and Water Borne Diseases Introduction). Regional laboratories do isolation and antibiotic resistance testing on stool samples. Isolates are then sent to NML for whole genome sequencing (WGS) and analysis. WGS reads the entire genetic code of the bacteria and the data is used for outbreak investigation and cluster detection. In addition, the O and H antigen serotype can now be done through WGS by an application called ecytpr.

Enteric PCR panels will identify STEC by the toxin gene right from the sample. Laboratories will report positive STEC based on PCR results alone. Multiple loci VNTR analysis (MLVA) is a technique to assess relatedness of isolates during outbreak investigation or for cluster detection. It has mainly been replaced for regular surveillance by WGS, but it is faster and might be done during emergency situations.

Laboratory Testing

An overview of testing timelines for samples after the sample has been received by the laboratory. Turnaround times are averages and may change depending on the urgency of the situation.



Reporting

Per Policy 2.2 Disease and Event Notification to OCMOHE and section 3 Disease and Event Reporting.

- Routine surveillance (RDSS) for all confirmed cases.
- Enhanced Surveillance. For all confirmed and for probable cases that are NAT or PCR positive, an enhanced surveillance form should be completed and information entered in the Access databases. Database extracts are submitted to OCMOHE on a weekly basis.

Case Management

Education

Case or relevant caregiver should be informed about:

- Nature of infection, length of communicable period and mode of transmission
- Enteric disease precautions
- Hand washing
- Environmental management
- Food safety
- Safe water source

Investigation

The severity of disease, particularly in children and the elderly, and the ability to spread person to person and via contaminated food means single cases require prompt investigation. Most cases are sporadic, but outbreaks can occur.

Use E. coli investigation form and obtain detailed history before onset including food, water, animal contact, farms, swimming, daycares and other institutions, and travel. Potential sources of infection should receive follow up appropriate to risk.

Exclusion/Social Distancing

Follow exclusion period guidelines for cases under investigation (cases, symptomatic and asymptomatic contacts) identified in high-risk individuals (food handlers, caregivers, and individuals in daycare centres and kindergartens).

Follow school exclusion guidelines for cases under investigation. Symptomatic cases among children under 5 years of age should be excluded from daycare until asymptomatic (i.e. no diarrhea or vomiting for 48 hours) and 2 successive negative stool cultures have been obtained, collected not less than 24 hours apart and at least 48 after antibiotic treatment.

Confirmed asymptomatic cases may not require exclusion provided they can adhere to proper hygiene practices as determined by the MOH.

Treatment

Adequate fluid replacement. Referral to health care professional if complications occur.

Immunization

Not applicable

Contact Management

Education

As per case management

Investigation

Identify contacts with significant exposure to cases (household contacts). Complete enteric investigation form per case management.

Provide stool specimen kits to contacts that are food handlers or are care givers, for example direct patient care, or care for children or elderly in institutional settings.

Exclusion/Social Distancing

Follow exclusion period guidelines for cases under investigation (cases, symptomatic and asymptomatic contacts) identified in high-risk individuals (food handlers, caregivers, and individuals in daycare centres and kindergartens).

Prophylaxis

Not applicable

Outbreak Management

Activate the local outbreak plan when an outbreak is declared.

Consider the following: provide hygiene advice to all cases and contacts, exclude high risk cases and contacts, enhanced cleaning in institutional outbreaks, supervised hand washing for children, urgent withdrawal of implicated food, and boil water notice for contaminated drinking water.