



Shiga toxin-producing *Escherichia coli* (STEC)

Background

Shiga toxin-producing *Escherichia coli* (STEC) can cause illness that ranges from mild diarrhea to bloody diarrhea, and life-threatening hemolytic uremic syndrome (HUS). The STEC serogroup most commonly identified and associated with severe illness in the United States is *E. coli* O157; however, there are over 50 other serogroups that can cause illness. An estimated 265,000 STEC infections occur each year in the United States.

Reporting

STEC, also referred to as Verocytotoxin-producing *E. coli* (VTEC) or enterohemorrhagic *E. coli* (EHEC) is individually reportable in Michigan. Many other *E. coli* pathotypes, including the following, are not individually reportable: enteroaggregative *E. coli* (EAEC), Enteropathogenic *E. coli* (EPEC), Enterotoxigenic *E. coli* (ETEC), Enteroinvasive *E. coli* (EIEC), and diffusely adherent *E. coli* (DAEC). Carbapenemase producing-carbapenem resistant Enterobacteriaceae (CP-CRE) are newly reportable; please refer to CP-CRE guidance materials for more information.

Note that while EIEC is not reportable as an *E. coli*, it may be reportable as Shigellosis if it is indistinguishable from *Shigella* in a clinical specimen using a culture-independent diagnostic testing (CIDT). Refer to the Shigellosis case definition found here: <https://www.cdc.gov/nndss/conditions/shigellosis/case-definition/2017/>

Additionally, according to the case definition, person with (1) detection of Shiga toxin or Shiga toxin genes using a CIDT and (2) isolation of *Shigella* spp. from a clinical specimen should not be reported as an STEC case.

Case Definition

The complete CDC case definition can be found at <https://www.cdc.gov/nndss/conditions/shiga-toxin-producing-escherichia-coli/case-definition/2018/>.

Suspect:

- Identification of an elevated antibody titer against a known Shiga toxin-producing serogroup of *E. coli* in a person with no known clinical compatibility, **OR**
- Detection of Shiga toxin or Shiga toxin genes in a clinical specimen using a CIDT and no known isolation of *Shigella* from a clinical specimen in a person with no known clinical compatibility, **OR**
- Detection of *E. coli* O157 or STEC/EHEC in a clinical specimen using a CIDT in a person with no known clinical compatibility, **OR**
- A person with a diagnosis of post-diarrheal HUS/TTP.

Probable:

- A person with isolation of *E. coli* O157 from a clinical specimen without confirmation of H antigen, detection of Shiga toxin or detection of Shiga toxin genes, **OR**
- A clinically compatible illness in a person with identification of an elevated antibody titer against a known Shiga toxin-producing serogroup of *E. coli*, **OR**

- A clinically compatible illness in a person with detection of Shiga toxin or Shiga toxin genes in a clinical specimen using a CIDT and no known isolation of *Shigella* from a clinical specimen, **OR**
- A clinically compatible illness in a person with detection of *E. coli* O157 or STEC/EHEC from a clinical specimen using a CIDT, **OR**
- A clinically compatible illness in a person that is epidemiologically linked to a confirmed or probable case with laboratory evidence, **OR**
- A clinically compatible illness in a person that is a member of a risk group as defined by public health authorities during an outbreak.

Confirmed

- A case that meets the confirmed laboratory criteria for diagnosis (isolation of *E. coli* O157:H7 from a clinical specimen OR isolation of *E. coli* from a clinical specimen with detection of Shiga toxin or Shiga toxin genes).

Laboratory Testing

- All relevant lab results should be entered into MDSS.
- Case classification insights:
 - Cases without laboratory support and no other qualifying information should be marked as **Not a Case**.
 - Cases without laboratory support but a proven epi-link to a confirmed or probable case are to be marked as **Probable**.
 - Those with a positive EIA should be classified as **Suspect**.
- To keep track of the case in MDSS, it may be a good idea to mark the case as **Completed-follow up** until confirmatory results are received. As new labs are received, complete the serotype and toxinotype section.
- Laboratories are required to submit all positive STEC isolates, subcultures, or specimens to the MDHHS Bureau of Laboratories (BOL) for confirmatory testing. There are two possible reasons for the absence of confirmatory results:
 - Results were negative. MDHHS BOL only reports negative test results to the submitter, not to the LHD (unless they were the submitter) or to MDSS. Check back with the submitter or your regional epidemiologist if test results do not appear in MDSS in a reasonable time frame.
 - The specimen was never sent to or received by MDHHS BOL. Reinforce specimen submission with your healthcare providers and laboratories.

Discordant Laboratory Results

- Due to certain issues with CIDT methods and degradation of organisms during transit, discordant results may occur between clinical and public health laboratories. Cases with detection of Shiga toxin or Shiga toxin genes should be classified as described below, regardless of any discordant results or lack of confirmatory testing.
- Cases with a positive CIDT (EIA or PCR) detection of Shiga toxin, Shiga toxin genes, *E. coli* O157 or STEC/EHEC and no known isolation of *Shigella* should be classified as:
 - **Suspect**, if not clinically compatible OR
 - **Probable**, if clinically compatible

STEC and HUS

- Post Diarrheal Hemolytic Uremic Syndrome (HUS) is diagnostic of STEC infection regardless of laboratory results.
- Cases that fit this description need to be entered into the MDSS **TWICE** – once as an HUS and once as an STEC case.
- The patient should be merged upon deduplication, but the cases should be kept separate.
- If there is no laboratory confirmation of STEC, the HUS case should be closed as **Confirmed** but the STEC should be closed as **Suspect**.

Interview Tips

The incubation period for STEC is 2-10 days (median 3-4 days) – longer than many other enteric illnesses, therefore, a seven-day meal history is recommended. Collected detailed information, such as brand and store location, on any high-risk items that were consumed such as ground beef, sprouts, raw juices, raw milk, and leafy greens.

An extended questionnaire is available for use that is recommended for use if you see possible clustering of suspect cases in your jurisdiction. If you choose to use this questionnaire, please note the date when it was administered in the comments section of the case investigation form. The extended questionnaire can be found here: www.michigan.gov/documents/mdch/ecoli-STEC_questionnaire_277685_7.pdf

Food Worker Exclusion/Restriction

STEC cases with duties as food handlers are specifically required under the Michigan Food Code to be excluded/restricted until certain conditions are met. STEC has a low infectious dose, and can easily be transmitted via the foodborne route as well as other routes. Work with environmental health to ensure appropriate restriction/exclusion of food workers with STEC infection.

Food Employee Foodborne Illness Guidelines

(MDARD): http://www.michigan.gov/documents/mda/MDA_FdEmplFBIGuidePoster_255329_7.pdf

Modified 2009 Michigan Food Code/Law:

www.michiganfoodsafety.com/images/MFSDocs/regulatory/foodlaw/MI_Modified_2009_Food_Code_396675_7.pdf

Resources

<https://www.cdc.gov/ecoli/general/index.html>