

What are *Escherichia coli*?

Escherichia coli (abbreviated as *E. coli*) are a large and diverse group of bacteria. Although most strains of *E. coli* are harmless, others can make you sick. Some kinds of *E. coli* can cause diarrhea, while others cause urinary tract infections, respiratory illness and pneumonia, and other illnesses. Still other kinds of *E. coli* are used as markers for water contamination—so you might hear about *E. coli* being found in drinking water, which are not themselves harmful, but indicate the water is contaminated. It does get a bit confusing—even to microbiologists.

What are Shiga toxin-producing *E. coli* (STEC)?

Some kinds of *E. coli* cause disease by making a toxin called Shiga toxin. The bacteria that make these toxins are called “Shiga toxin-producing” *E. coli*, or STEC for short. You might hear these bacteria called verocytotoxin *E. coli* (VTEC) or enterohemorrhagic *E. coli* (EHEC); these all refer generally to the same group of bacteria. The most commonly identified STEC in North America is *E. coli* O157:H7 (often shortened to *E. coli* O157 or even just “O157”). When you hear news reports about outbreaks of “*E. coli*” infections, they are usually talking about *E. coli* O157.

In addition to *E. coli* O157, many other kinds (called serogroups) of STEC cause disease. Other *E. coli* serogroups in the STEC group are sometimes called “non-O157 STECs”. Compared with STEC O157 infections, identification of non-O157 STEC infections is more complex. First, clinical laboratories must test stool samples for the presence of Shiga toxins. Then, the positive samples must be sent to public health laboratories to look for non-O157 STEC. Clinical laboratories typically cannot identify non-O157 STEC. Other non-O157 STEC serogroups that often cause illness in people in the United States include O26, O145, O111, and O103. Some types of STEC frequently cause severe disease, including bloody diarrhea and hemolytic uremic syndrome (HUS), which is a type of kidney failure.

Are there important differences between *E. coli* O157 and other STEC?

Most of what we know about STEC comes from studies of *E. coli* O157 infection, which was first identified as a pathogen in 1982. Less is known about the non-O157 STEC, partly because older laboratory practices did not identify non-O157 infections. As a whole, the non-O157 serogroups are less likely to cause severe illness than *E. coli* O157, though sometimes they can. For example, *E. coli* O26 produces the same type of toxins that *E. coli* O157 produces and causes a similar illness, though it is typically less likely to lead to kidney problems (called hemolytic uremic syndrome, or HUS).

Who gets STEC infections?

People of any age can become infected. Very young children and the elderly are more likely to develop severe illness and hemolytic uremic syndrome (HUS) than others, but even healthy older children and young adults can become seriously ill.

What are the symptoms of STEC infections?

The symptoms of STEC infections vary for each person but often include severe stomach cramps, diarrhea (often bloody), and vomiting. If there is fever, it usually is not very high (less than 101°F/less than 38.5°C). Most people get better within 5 to 7 days. Some infections are very mild, but others are severe or even life-threatening.

What is hemolytic uremic syndrome (HUS), a complication of STEC infections?

Around 5-10% of those who are diagnosed with STEC infection develop a potentially life-threatening complication known as hemolytic uremic syndrome (HUS). Clues that a person is developing HUS include decreased frequency of urination, feeling very tired, and losing pink color in cheeks and inside the lower eyelids. Persons with HUS should be hospitalized because their kidneys may stop working and they may develop other serious problems.

Most persons with HUS recover within a few weeks, but some suffer permanent damage or die.

How soon do symptoms appear after exposure?

The time between ingesting the STEC bacteria and feeling sick is called the "incubation period". The incubation period is usually 3-4 days after the exposure but may be as short as 1 day or as long as 10 days. The symptoms often begin slowly with mild belly pain or non-bloody diarrhea that worsens over several days. HUS, if it occurs, develops an average 7 days after the first symptoms, when the diarrhea is improving.

Where do STEC come from?

STEC live in the guts of ruminant animals, including cattle, goats, sheep, deer, and elk. The major source for human illnesses is cattle. STEC that cause human illness generally do not make animals sick. Other kinds of animals, including pigs and birds, sometimes pick up STEC from the environment and may spread it.

How are these infections spread?

Infections start when you swallow STEC — in other words, when you get tiny (usually invisible) amounts of human or animal feces in your mouth. Unfortunately, this happens more often than we would like to think about. Exposures that result in illness include consumption of contaminated food, consumption of unpasteurized (raw) milk, consumption of water that has not been disinfected, contact with cattle, or contact with the feces of infected people. Some foods are considered to carry such a high risk of infection with *E. coli* O157 or another germ that health officials recommend that people avoid them completely. These foods include unpasteurized (raw) milk, unpasteurized apple cider, and soft cheeses made from raw milk. Sometimes the contact is obvious (working with cows at a dairy or changing diapers, for example), but sometimes it is not (like eating an undercooked hamburger or a contaminated piece of lettuce). People have gotten infected by swallowing lake water while swimming, by touching the environment in petting zoos and other animal exhibits, and by eating food prepared by people who did not wash their hands well after using the toilet. Almost everyone has some risk of infection.

Where did my infection come from?

Because there are so many possible sources, for most people we can only guess. If your infection happens to be part of the about 20% of cases that are part of a recognized outbreak, the health department might identify the source.

How common are STEC infections?

An estimated 265,000 STEC infections occur each year in the United States. STEC O157 causes about 36% of these infections, and non-O157 STEC cause the rest. Public health experts rely on estimates rather than actual numbers of infections because not all STEC infections are diagnosed, for several reasons. Many infected people do not seek medical care; many of those who do seek care do not provide a stool specimen for testing, and many labs do not test for non-O157 STEC. However, this situation is changing as more labs have begun using newer, simpler tests that can help detect non-O157 STEC.

How are STEC infections diagnosed and when should I contact my healthcare provider?

STEC infections are usually diagnosed through laboratory testing of stool specimens (feces). Identifying the specific strain of STEC is essential for public health purposes, such as finding outbreaks. Many labs can determine if STEC are present, and most can identify *E. coli* O157. Labs that test for the presence of Shiga toxins in stool can detect non-O157 STEC infections. However, for the O group (serogroup) and other characteristics of non-O157 STEC to be identified, Shiga toxin-positive specimens must be sent to a state public health laboratory. Contact your healthcare provider if you have diarrhea that lasts for more than 3 days, or is accompanied by high fever, blood in the stool, or so much vomiting that you cannot keep liquids down and you pass very little urine.

What is the best treatment for STEC infection?

Non-specific supportive therapy, including hydration, is important. Antibiotics should not be used to treat this infection. There is no evidence that treatment with antibiotics is helpful and taking antibiotics may increase the risk of HUS. Antidiarrheal agents like Imodium® may also increase that risk.

How can STEC infections be prevented?

- WASH YOUR HANDS thoroughly after using the bathroom or changing diapers and before preparing or eating food. WASH YOUR HANDS after contact with animals or their environments (at farms, petting zoos, fairs, even your own backyard).
- COOK meats thoroughly. Ground beef and meat that has been needle-tenderized should be cooked to a temperature of at least 160°F/70°C. It is best to use a thermometer, as color is not a very reliable indicator of “doneness”.
- AVOID raw milk, unpasteurized dairy products, and unpasteurized juices (like fresh apple cider).
- AVOID swallowing water when swimming or playing in lakes, ponds, streams, swimming pools, and backyard “kiddie” pools.
- PREVENT cross contamination in food preparation areas by thoroughly washing hands, counters, cutting boards, and utensils after they touch raw meat.

For more information, please visit these websites:

- CDC *E. coli*: www.cdc.gov/ecoli

SAMPLE LETTER TO PARENTS/GUARDIAN

Dear Parents/Guardian:

A case of Shiga toxin-producing *E. coli* (STEC), *E. coli* O157:H7, and/or hemolytic uremic syndrome (HUS) has occurred in your child's classroom. This bacterium, *E. coli* O157:H7, can cause intestinal infection consisting of severe bloody diarrhea and abdominal cramps. Usually little or no fever is present, and the illness resolves in 5 to 10 days.

In some persons, particularly children under 5 years of age and the elderly, the bacterial infection produces a toxin which can cause a complication called hemolytic uremic syndrome (HUS). HUS affects the kidneys and blood clotting system. HUS occurs in approximately 2%-7% of the patients with *E. coli* O157:H7 infection. HUS often requires extensive hospitalization and therapy.

Persons can become infected with *E. coli* O157:H7 by ingesting the bacteria in undercooked beef, especially hamburger. Spread can occur easily among groups of small children because of their close contact and lack of well-developed personal hygiene skills. Frequent and thorough hand washing, especially after using the toilet and before eating, is important in preventing spread of this disease.

Due to the serious nature of HUS, arrangements have been made with the Ohio Department of Health for free STEC screening in your child's classroom. We highly recommend and urge you to take advantage of this opportunity.

In order to find out if your child has *E. coli* O157:H7 or STEC, a stool specimen must be collected. The materials needed to do this are included with this letter. You should have a screw-capped tube partially filled with liquid.

Directions:

1. Make sure the patient information section on the side of the vial is completed.
2. Pass the stool into a clean, dry, container such as a margarine tub, wide mouth jar, milk carton with the top cut off, or if available a bedpan or stool hat.
3. Use the collection spoon built into the lid of the vial to place small scoopfuls of the stool into the vial until the contents of the vial rise to the "FILL LINE" on the vial label.
4. For best results, select areas of the stool that appear bloody or watery. If the stool is formed (hard), sample small amounts from each end and the middle.
5. When sufficient stool added to raise the level to the "FILL LINE", replace and twist the cap onto the vial to tightly close.
6. Once the cap is tight, shake the vial vigorously until the contents are well mixed.
7. Wash your hands thoroughly after collection of the specimen.
8. Place properly labeled vial into a zip-lock plastic specimen bag or other leak-proof container. Do not place the specimen paperwork unprotected within the same zip-lock bag or container with the vial to prevent contamination should the sample leak.
9. Return the sample and paperwork immediately to your local health department or location as instructed when you were given the collection kit.
10. Store and transport at room temperature.

Thank you for your cooperation. If you have any questions, please contact (RN) at the (local) Health Department, (telephone number).

Sincerely,