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Ground Water & Drinking Water

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E. coli O157:H7 in drinking water -- US EPA

E. coli in drinking water

One of hundreds of strains of the bacterium *Escherichia coli*, *E. coli* O157:H7 is an emerging cause of foodborne and waterborne illness. Although most strains of *E. coli* are harmless and live in the intestines of healthy humans and animals, this strain produces a powerful toxin and can cause severe illness. *E. coli* O157:H7 was first recognized as a cause of illness during an outbreak in 1982 traced to contaminated hamburgers. Since then, most infections are believed to have come from eating undercooked ground beef.

However, some have been waterborne. In 1999, people became sick after drinking contaminated water in Washington County, New York and swimming in contaminated water in Clark County, Washington. Information about the health effects of *E. coli* O157:H7, and actions you can take to protect yourself and your family from *E. coli* infection is provided below. You can also read [the Centers for Disease Control and Prevention's fact sheet on *E. coli*](#) [EXIT disclaimer](#) and [the Food and Drug Administration's Bad Bug Book](#). [EXIT disclaimer](#)

What is *E. coli* and where does it come from?

E. coli is a type of fecal coliform bacteria commonly found in the intestines of animals and humans. *E. coli* is short for *Escherichia coli*. The presence of *E. coli* in water is a strong indication of recent sewage or animal waste contamination. Sewage may contain many types of disease-causing organisms.

What are fecal coliforms?

Fecal coliforms are bacteria that are associated with human or animal wastes. They usually live in human or animal intestinal tracts, and their presence in drinking water is a strong indication of recent sewage or animal waste contamination.

How does *E. coli* or other fecal coliforms get in the water?

E. coli comes from human and animal wastes. During rainfalls, snow melts, or other types of precipitation, *E. coli* may be washed into creeks, rivers, streams, lakes, or groundwater. When these waters are used as sources of drinking water and the water is not treated or inadequately treated, *E. coli* may end up in drinking water.

What are the health effects of *E. coli* O157:H7?

E. coli O157:H7 is one of hundreds of strains of the bacterium *E. coli*. Although most strains are harmless and live in the intestines of healthy humans and animals, this strain produces a powerful toxin and can cause severe illness. Infection often causes severe bloody diarrhea and abdominal cramps; sometimes the infection causes non-bloody diarrhea. Frequently, no fever is present. It should be noted that these symptoms are common to a variety of diseases, and may be caused by sources other than contaminated drinking water.

In some people, particularly children under 5 years of age and the elderly, the infection can also cause a complication called hemolytic uremic syndrome, in which the red blood cells are destroyed and the kidneys fail. About 2%-7% of infections lead to this

complication. In the United States, hemolytic uremic syndrome is the principal cause of acute kidney failure in children, and most cases of hemolytic uremic syndrome are caused by *E. coli* O157:H7. Hemolytic uremic syndrome is a life-threatening condition usually treated in an intensive care unit. Blood transfusions and kidney dialysis are often required. With intensive care, the death rate for hemolytic uremic syndrome is 3%-5%.

How long does it take for these symptoms of *E. coli* O157:H7 infection to occur?

Symptoms usually appear within 2 to 4 days, but can take up to 8 days. Most people recover without antibiotics or other specific treatment in 5-10 days. There is no evidence that antibiotics improve the course of disease, and it is thought that treatment with some antibiotics may precipitate kidney complications. Antidiarrheal agents, such as loperamide (Imodium), should also be avoided.

What should I do if I have any of the above symptoms?

Consult with your physician. Infection with *E. coli* O157:H7 is diagnosed by detecting the bacterium in the stool. Most laboratories that culture stool do not test for *E. coli* O157:H7, so it is important to request that the stool specimen be tested on sorbitol-MacConkey (SMAC) agar for this organism. All persons who suddenly have diarrhea with blood should get their stool tested for *E. coli* O157:H7.

Are there groups of people who are at greater risk of getting any of the symptoms?

Children under the age of five, the elderly, and people whose health is weakened (i.e., people who have long-term illnesses such as cancer or AIDS) are at greater risk of severe illness.

What should these people who are at greater risk do? Are there any additional precautions they should take?

People who are at greater risk should consult with their doctor or health care provider and follow the instructions provided.

How will I know if my water is safe?

If you get your water from a public water system, then your water system is required by law to notify you if your water is not safe. If you are interested in obtaining information about your drinking water, consult the water quality report that you should receive annually from your local water system, or call your local water system directly. Information on local water systems is also available on EPA's web site at www.epa.gov/safewater/dwinfo.htm.

How is water treated to protect me from *E. coli*?

The water can be treated using chlorine, ultra-violet light, or ozone, all of which act to kill or inactivate *E. coli*. Systems using surface water sources are required to disinfect to ensure that all bacterial contamination is inactivated, such as *E. coli*. Systems using ground water sources are not required to disinfect, although many of them do.

If I have a private well, how can I have it tested for *E. coli*?

If you have a private well, you should have your water tested periodically. Contact your State laboratory certification officer to find out which laboratories have been certified for conducting total coliform analyses. (You may contact the Safe Drinking Water Hotline at 1-800-426-4791 for the address and phone number of this individual.) Then contact a certified lab near you and get instructions on how to send them a water sample. Typically, the lab will first test for total coliforms, which is a group of related organisms that is common in both the environment and in the gut of animals. If the sample is positive for total coliforms, the lab will determine whether *E. coli* is also present. *E. coli* is a type of total coliform that is closely associated with recent fecal contamination. Few *E. coli* strains cause disease. However, the presence of any *E. coli* in a water sample suggests that disease-causing organisms, are also likely to be present.

One of the strains of *E. coli* that causes disease is *E. coli* O157:H7. EPA does not believe

it necessary for an owner of a private well to test specifically for this organism under normal circumstances. If *E. coli* O157:H7 is present in your well, it is highly likely that other strains of *E. coli* are also present. If a well is *E. coli*-positive, regardless of strain, you should not drink the water unless it is disinfected. Several tests are available for determining whether *E. coli* O157:H7 is present, but they are somewhat more expensive than the standard *E. coli* tests and many labs may not have the expertise or supplies to perform these tests. Your state's laboratory certification officer should be able to tell you which laboratories can perform these tests, or you can contact the lab directly.

If my well is contaminated with *E. coli*, what can I do to protect myself?

If your well tests positive for *E. coli*, do not drink the water unless you boil it for at least one minute at a rolling boil, longer if you live at high altitudes. You may also disinfect the well according to procedures recommended by your local health department. Monitor your water periodically after disinfection to make certain that the problem does not recur. If the contamination is a recurring problem, you should investigate the feasibility of drilling a new well or install a point-of-entry disinfection unit, which can use chlorine, ultraviolet light, or ozone.

How does the U.S. Environmental Protection Agency regulate *E. coli*?

According to EPA regulations, a system that operates at least 60 days per year, and serves 25 people or more or has 15 or more service connections, is regulated as a public water system under the Safe Drinking Water Act. If a system is not a public water system as defined by EPA's regulations, it is not regulated under the Safe Drinking Water Act, although it may be regulated by state or local authorities.

Under the Safe Drinking Water Act, EPA requires public water systems to monitor for coliform bacteria. Systems analyze first for total coliform, because this test is faster to produce results. Any time that a sample is positive for total coliform, the same sample must be analyzed for either fecal coliform or *E. coli*. Both are indicators of contamination with animal waste or human sewage.

The largest public water systems (serving millions of people) must take at least 480 samples per month. Smaller systems must take at least five samples a month unless the state has conducted a sanitary survey – a survey in which a state inspector examines system components and ensures they will protect public health – at the system within the last five years.

Systems serving 25 to 1,000 people typically take one sample per month. Some states reduce this frequency to quarterly for ground water systems if a recent sanitary survey shows that the system is free of sanitary defects. Some types of systems can qualify for annual monitoring.

Systems using surface water, rather than ground water, are required to take extra steps to protect against bacterial contamination because surface water sources are more vulnerable to such contamination. At a minimum, all systems using surface waters must disinfect. Disinfection will kill *E. coli* O157:H7.

What can I do to protect myself from *E. coli* O157:H7 in drinking water?

Approximately 89 percent of Americans are receiving water from community water systems that meet all health-based standards. Your public water system is required to notify you if, for any reason, your drinking water is not safe. If you wish to take extra precautions, you can boil your water for one minute at a rolling boil, longer at higher altitudes. To find out more information about your water, see the Consumer Confidence Report from your local water supplier or contact your local water supplier directly. You can also obtain information about your local water system on EPA's web site at www.epa.gov/safewater/dwinfo.htm.

If you draw water from a private well, you can contact your state health department to obtain information on how to have your well tested for total coliforms and *E. coli* contamination. If your well tests positive for *E. coli*, there are several steps that you

should take: (1) begin boiling all water intended for consumption, (2) disinfect the well according to procedures recommended by your local health department, and (3) monitor your water quality to make certain that the problem does not recur. If the contamination is a recurring problem, you should investigate the feasibility of drilling a new well or install a point-of-entry disinfection unit, which can use chlorine, ultraviolet light, or ozone.

The Centers for Disease Control and Prevention (CDC) suggests other actions that you may take to prevent *E. coli* infection. These include:

- Avoid swallowing lake or pool water while swimming.
- Thoroughly cook ground beef and avoid unpasteurized milk.
- Make sure that persons with diarrhea, especially children, wash their hands carefully with soap after bowel movements to reduce the risk of spreading infection, and that persons wash hands after changing soiled diapers. Anyone with a diarrheal illness should avoid swimming in public pools or lakes, sharing baths with others, and preparing food for others.
- Cook all ground beef and hamburger thoroughly. Because ground beef can turn brown before disease-causing bacteria are killed, use a digital instant-read meat thermometer to ensure thorough cooking. Ground beef should be cooked until a thermometer inserted into several parts of the patty, including the thickest part, reads at least 160° F. Persons who cook ground beef without using a thermometer can decrease their risk of illness by not eating ground beef patties that are still pink in the middle.
- If you are served an undercooked hamburger or other ground beef product in a restaurant, send it back for further cooking. You may want to ask for a new bun and a clean plate, too.
- Avoid spreading harmful bacteria in your kitchen. Keep raw meat separate from ready-to-eat foods. Wash hands, counters, and utensils with hot soapy water after they touch raw meat. Never place cooked hamburgers or ground beef on the unwashed plate that held raw patties. Wash meat thermometers in between tests of patties that require further cooking.
- Drink only pasteurized milk, juice, or cider. Commercial juice with an extended shelf-life that is sold at room temperature (e.g. juice in cardboard boxes, vacuum sealed juice in glass containers) has been pasteurized, although this is generally not indicated on the label. Juice concentrates are also heated sufficiently to kill pathogens.
- Wash fruits and vegetables thoroughly, especially those that will not be cooked. Children under 5 years of age, immunocompromised persons, and the elderly should avoid eating alfalfa sprouts until their safety can be assured. Methods to decontaminate alfalfa seeds and sprouts are being investigated.

Will a water filter work to keep *E. coli* out of my water?

Most in-home filters will not. EPA recommends that you boil your water if you are concerned about its safety.

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