

E. coli O157:H7

Quick Facts about *E. coli* O157:H7

Name—*Escherichia coli* (*E. coli*) O157:H7

Disease—Hemorrhagic Colitis

Onset—Usually 3 to 4 days (may be 1 to 10 days)

Symptoms: Severe abdominal cramping and diarrhea, which is at first watery but becomes grossly bloody. The patient may have vomiting and a low-grade fever. Some individuals have watery diarrhea only. The patient usually recovers after an average of 8 days.

Associated Foods: Raw or undercooked ground beef, raw milk and soft cheeses made from raw milk, lettuce, spinach, unpasteurized apple juice or cider, alfalfa sprouts, game meats.

Prevention: Cook meat to an appropriate temperature; avoid cross-contamination; use sanitary practices; drink pasteurized milk and juices.

The Organism

The bacterium *E. coli* O157:H7, also known as O157, is a rare but dangerous type of *E. coli*. It lives in the intestinal tracts of mammals and man. Some healthy cattle, deer, sheep and goats carry the bacterium. It can be transferred from animal to animal, animal to man, from animal to man on food, and from person to person through close contact or food. *E. coli* O157:H7 can survive refrigeration and freezer storage. Thorough cooking to 160 °F is the best safeguard against infection.

The O157 pathogen was recognized in 1982 after the investigation of two outbreaks of a bloody diarrhea syndrome. The outbreaks were traced to undercooked hamburgers served from a fast food chain. It is estimated that there may be about 70,000

cases of infection in the United States each year. The number of people who get sick may still be underestimated. The organism is difficult to identify if testing is not done at the beginning of the infection. Individuals with mild cases of illness may not see a doctor, and the illness is then not reported.

The Disease

The most common symptom of O157 infection is bloody diarrhea. About 10 to 20 percent of patients with bloody diarrhea can develop more severe diseases—hemorrhagic colitis, hemolytic uremic syndrome (HUS) or thrombotic thrombocytopenic purpura (TTP). HUS is a life-threatening condition usually treated in an intensive care unit. Blood transfusions and kidney dialysis are often needed. With intensive care, the death rate for HUS is 3 to 5 percent.

People who only have diarrhea usually recover completely in 5 to 10 days. A small proportion have immediate complications with hemolytic uremic syndrome and lifelong complications, such as persistent kidney failure, blindness, paralysis and the effects of having part of their bowel removed.

Do not take antibiotics or antidiarrheal medicines, such as loperamide (Imodium) if you have bloody diarrhea. These medicines will not help and they may cause kidney complications.

Anyone can get sick from O157, but those with the greatest risk include the very young (children under 5 years of age), the elderly (greater than 65 years of age), and those who are already ill and have seriously weakened immune systems. People with compromised immune systems should ask their doctor about special food and food safety recommendations to avoid the risk of infection.

Infection with *E. coli* O157:H7 is diagnosed when the bacterium is found in the stool. About one-third of the laboratories that culture stools 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.

Hemorrhagic Colitis: Symptoms of hemorrhagic colitis include severe abdominal cramps, bloody stools, little or no fever, and erosion and hemorrhage of the colon. The first symptoms usually occur 2 to 8 days after eating contaminated food. The illness can last 5 to 10 days and can be severe enough to result in hospitalization.

Hemolytic Uremic Syndrome (HUS): Less than 10 percent of cases with bloody diarrhea will develop HUS. HUS causes hemolytic anemia (destruction of red blood cells), affects the central nervous system and causes kidney failure. Kidney failure is the most significant symptom of HUS. About half of the HUS patients need dialysis, and 3 to 5 percent of HUS cases are fatal.

Thrombotic Thrombocytopenic Purpura (TTP): TTP has symptoms similar to HUS. However, the most significant is severe neurologic damage. Complications can include seizures, stroke or coma. Kidney damage is less severe than with HUS. This disease is primarily found in adults, especially the elderly. The death rate of TTP can be as high as 50 percent.

Food Sources

Undercooked hamburger and roast beef, raw milk, unpasteurized apple juice and cider, contaminated water, venison, lettuce, and spinach have caused outbreaks in this country over the last 10 years.

E. coli O157:H7 can be spread by contact with fecal matter during processing of animal foods or because of improper food handling. Improper handling may happen because infected food workers have not washed their hands properly before touching the food or the utensils used to prepare food.

Plant foods can become contaminated from fertilization with raw manure, irrigation with contaminated water, or contamination by human or

wild animal contact. Some outbreaks have been caused by contaminated municipal and recreational water.

Prevention Strategies

While *E. coli* O157:H7 can cause severe disease, it can be effectively controlled by thorough cooking. Cook ground meats (beef, pork, veal, lamb) to a uniform internal temperature of at least 160 °F, roasts and steaks (beef, veal, lamb) to an internal temperature of at least 145 °F, all pork to 160 °F, and all poultry to 165 °F. Keep hot foods at or above 140 °F and cold foods at or below 40 °F.

Follow safe handling practices when preparing foods that you eat raw, such as fruits and vegetables. For more information, see [HGIC 3517, *Safe Handling of Fresh Fruits & Vegetables*](#).

Always follow these safe food handling recommendations:

- Cook raw hamburger to the proper internal temperature (160 °F). In a restaurant, make sure a hamburger is thoroughly cooked before eating it. If a hamburger is undercooked, do not be afraid to return it.
- Avoid drinking unpasteurized milk and unpasteurized apple juice or cider.
- Wash hands after handling raw meat to prevent contamination of other food. Wash hands properly and often to help keep germs from passing from person-to-person. This is especially important to teach children. See [HGIC 4360, *Handwashing—It Makes a Difference!*](#)
- Drink water from tested public or well sources, not from untreated streams or lakes.
- Wash fruits and vegetables thoroughly using only clean, drinkable water.
- Carefully follow “keep refrigerated,” “sell-by” and “use-by” dates.

Latest Findings for Prevention

Microbiological studies on beef carcasses and ground beef in slaughter and processing plants have shown that very few carcasses are contaminated with O157. Beef producers, processors and retailers use many strategies to prevent *E. coli* O157:H7 contamination. However, as long as there is the possibility of contamination with *E. coli* O157:H7, it is important for consumers to follow the

recommendations to cook meats to the proper internal temperature.

The Hazard Analysis Critical Control Point (HACCP) system is a means for developing food safety programs. This system is used to identify hazards that cause food safety problems and then develop steps to prevent, control or eliminate these hazards in each step of the food production process. The United States Department of Agriculture (USDA) established new requirements for slaughter and processing plants that were fully in use by the year 2000.

As part of the HACCP programs, one or more methods to reduce microbial contamination are used on all beef carcasses that will be sold. These include washing animals as they enter the processing plant, carcass washing with organic acid (or hot water or both), steam vacuuming, steam pasteurization, and the use of antimicrobial agents.

The beef industry is working hard to reduce the level of *E. coli* O157:H7 contamination on animals **before** they arrive at a processing facility. This is done by changes in the grain-to-grass ratio and the quality of the feed, reduced numbers of animals in a feed lot, improved biosecurity, and improved management and transportation practices.

Researchers are looking for new ways to reduce O157:H7 contamination. At this time, the most promising is research on vaccines to reduce the shedding of O157:H7 by cattle. A bacteriophage spray that would kill O157:H7 organisms on the hide and the use of harmless bacteria that would compete with O157:H7 in the intestines of cattle are also being studied.

The Food and Drug Administration (FDA) has approved irradiation (cold pasteurization) of beef for pathogen reduction. Irradiation could lead to an almost 100% elimination of O157:H7 in beef. However, processors are reluctant to invest in this strategy because of low consumer acceptance of irradiated products.

Questions About *E. coli*

Is it riskier to eat a rare hamburger than a rare steak or roast?

Yes. Undercooked hamburger is riskier because of the kind of handling and preparation hamburger receives. Surface bacteria may be spread throughout the meat during grinding. Also, ground meat is often made with trimmings from several cuts. This does not mean it is perfectly safe to eat other cuts raw or rare. ALL meat, poultry and fish should be cooked to the correct internal temperature.

How can I tell if the ground beef I buy is safe to eat?

You can't tell whether ground beef is safe simply by looking at it or smelling it, which is why you should always follow the safe handling recommendations listed here. If an off-odor is apparent, return it to the store.

Does freezing kill *E. coli*?

No. That's why it is important to cook all foods thoroughly and follow the safe handling recommendations listed here.

Resources

For Further Information on *E. coli*, Contact:

USDA Meat and Poultry Hotline
Monday–Friday, 10 a.m.–4 p.m. ET
(800) 535-4555

Centers for Disease Control and Prevention
Foodborne Illness Information Line
24-hour recorded information
(404) 332-4597

National Cattlemen's Beef Association (NCBA),
9110 E. Nichols Ave. #300, Centennial, CO 80112
303-694-0305

Sources:

1. Center for Disease Control and Prevention (CDC). *Escherichia coli* O157:H7. July 2010. http://www.cdc.gov/nczved/divisions/dfbmd/diseases/ecoli_o157h7/index.html
2. International Food Information Council Foundation (IFIC). January 2007. *A Consumer's Guide To Food Safety Risks* <http://ific.org/publications/other/consumersguideom.cfm>
3. U.S. FDA 2009 (Updated). *Bad Bug Book. Escherichia coli* O157:H7 <http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm071284.htm>

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