

Escherichia Coli O157:H7

Bioterrorism Agent Profiles for Health Care Workers

Causative Agent: *Escherichia coli* serotype O157:H7 is a gram-negative, rod-shaped bacterium that produces Shiga toxin(s). This rare variety of *E.coli* produces large quantities of potent toxins that cause severe damage to the lining of the intestines, leading to hemorrhagic colitis.

Routes of Exposure: Ingestion of contaminated food or water is the main route of exposure, but direct person-to-person contact can also spread infection.

Infective Dose & Infectivity: May be as few as 10 organisms. All people are believed to be susceptible to hemorrhagic colitis, but young children and the elderly appear to progress to more serious symptoms more frequently.

Incubation Period: The incubation can be from 2 to 8 days, but it usually ranges from 3 to 4 days.

Clinical Effects: The illness is characterized by severe cramping (abdominal pain) and diarrhea which is initially watery, but becomes grossly bloody. Occasionally vomiting occurs. Fever is either low-grade or absent. The illness is usually self-limited and lasts for an average of 8 days. Some individuals exhibit watery diarrhea only.

A severe clinical manifestation of *E. coli* O157:H7 infection is hemolytic uremic syndrome (HUS). Up to 15% of those with bloody diarrhea from *E. coli* O157:H7 can develop HUS, which can lead to permanent kidney failure.

Lethality: The overall mortality rate for *E. coli* O157:H7 is <1%. For those who develop HUS, the death rate is between 3-5%.

Transmissibility: The major source of transmission is the consumption of raw or undercooked ground beef. Other sources of transmission include unpasteurized milk and juice, alfalfa sprouts, lettuce, dry-cured salami, and contact with infected animals. Waterborne transmission can occur by swimming in or drinking inadequately chlorinated water such as that found in contaminated lakes and swimming pools. The organism is easily transmitted from person-to-person when proper hand washing techniques are not used.

Primary Contamination & Methods of Dissemination: In a terrorist attack, *E. coli* would most likely occur due to intentional contamination of food or water supplies. In addition aerosolization could be a possibility.

Secondary Contamination & Persistence of organism: Secondary transmission can result from exposure to the stool of patients with overt disease. Diarrheal fluids are highly infectious. The period of infectivity of stool is typically a week or less in adults but 3 weeks in one-third of children. Prolonged carriage of *E. coli* O157:H7 in the stool is uncommon.

Decontamination & Isolation:

Patients – No decontamination necessary. Patients can be treated with standard precautions, with contact precautions for diapered or incontinent patients. Hand washing is of particular importance.

Equipment & other objects – 0.5% hypochlorite solution (one part household bleach and nine parts water), EPA approved disinfectants, and/or soap and water can be used for environmental decontamination.

Laboratory Testing: Clinical laboratories can screen for *E. coli* O157:H7 in stool samples by using sorbitol-MacConkey agar.

Therapeutic Treatment: Most people recover without specific treatment in five to ten days. For uncomplicated cases, rehydration may be all that is required. Fluid and electrolyte replacement is important when diarrhea is watery or there are signs of dehydration. Antibiotics are often avoided in *E. coli* O157:H7 infections, since some evidence suggests that antibiotic treatment may precipitate complications such as HUS.

Prophylactic Treatment: No vaccine is available to prevent *E. coli* O157:H7 infections.

Differential Diagnosis: *Salmonella*, *Shigella*, *Campylobacter*, *Yersinia enterocolitis*, and bacterial food poisoning may show similar signs and symptoms.

References:

Chin J. Control of Communicable Diseases Manual, Seventeenth Edition, American Public Health Association; 2000.

Foodborne Pathogenic Microorganisms and Natural Toxins Handbook, Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration <http://vm.cfsan.fda.gov/~mow/intro.html>

For more information call (602) 364-3289

Frequently Asked Questions About Escherichia Coli O157:H7

What is *Escherichia coli* O157:H7?

Escherichia coli O157:H7 is one of hundreds of strains of the bacterium *Escherichia 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.

E. coli O157:H7 was first recognized as a cause of illness in 1982 during an outbreak of severe bloody diarrhea; the outbreak was traced to contaminated hamburgers. Since then, most infections have come from eating undercooked ground beef.

The combination of letters and numbers in the name of the bacterium refers to the specific markers found on its surface and distinguishes it from other types of *E. coli*.

How is *E. coli* O157:H7 spread?

The organism can be found on a small number of cattle farms and can live in the intestines of healthy cattle. Meat can become contaminated during slaughter, and organisms can be thoroughly mixed into beef when it is ground. Bacteria present on the cow's udders or on equipment may get into raw milk.

Eating meat, especially ground beef, that has not been cooked sufficiently to kill *E. coli* O157:H7 can cause infection. Contaminated meat looks and smells normal. Although the number of organisms required to cause disease is not known, it is suspected to be very small.

Among other occasional sources of infection are sprouts, lettuce, salami, unpasteurized milk and juice, and swimming in or drinking sewage-contaminated water.

Bacteria in diarrheal stools of infected persons can be passed from one person to another if hygiene or handwashing habits are inadequate. This is particularly likely among toddlers who are not toilet trained. Family members and playmates of these children are at high risk of becoming infected.

What illness does *E. coli* O157:H7 cause?

E. coli O157:H7 infection often causes severe bloody diarrhea and abdominal cramps; sometimes the infection causes nonbloody diarrhea or no symptoms. 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 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.

How is *E. coli* O157:H7 infection diagnosed?

Infection with *E. coli* O157:H7 is diagnosed by detecting the bacterium in the stool. All persons who suddenly have diarrhea with blood should get their stool tested for *E. coli* O157:H7.

How is the illness treated?

Most persons recover without antibiotics or other specific treatment in 5-10 days. There is no evidence that antibiotics improve the course of disease, and there is a concern that treatment with antibiotics may lead to kidney complications. Antidiarrheal agents, such as loperamide (Imodium), should also be avoided.

Hemolytic uremic syndrome is a potentially life-threatening. Blood transfusions and kidney dialysis are often required. With intensive care, the death rate for hemolytic uremic syndrome is 3%-5%.

What are the long-term consequences of infection?

Persons who only have diarrhea without HUS usually recover completely. Patients with HUS can develop to high blood pressure or chronic renal failure.

Lethality: The overall mortality rate for *E. coli* O157:H7 is <1%. For those who develop HUS, the death rate is between 3-5%.

What can be done to prevent *E. coli* O157:H7 infection?

There are several things you can do to reduce your risk of infection:

- Cook all ground beef and hamburger thoroughly.
- Keep raw meat separate from ready-to-eat foods.
- Wash hands, counter tops, and utensils with hot soapy water after they touch raw meat.
- Drink only pasteurized milk, juice, or cider.
- Wash fruits and vegetables thoroughly, especially those that will not be cooked.
- Drink municipal water that has been treated with chlorine or other effective disinfectants.
- Avoid swallowing lake or pool water while swimming.
- 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.

For more information call (602) 364-3289