

Bacteria and Foodborne Illness

National Digestive Diseases Information Clearinghouse



National
Institute of
Diabetes and
Digestive
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Diseases

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Foodborne illness results from eating food contaminated with bacteria (or their toxins) or other pathogens such as parasites or viruses. The illnesses range from upset stomach to more serious symptoms, including diarrhea, fever, vomiting, abdominal cramps, and dehydration. Although most foodborne infections are undiagnosed and unreported, the Centers for Disease Control and Prevention estimates that every year about 76 million people in the United States become ill from pathogens in food. Of these, up to 5,000 die.

Causes

Harmful bacteria are the most common causes of foodborne illnesses. Some bacteria may be present on foods when you purchase them. Raw foods are not sterile. Raw meat and poultry may become contaminated during slaughter. Seafood may become contaminated during harvest or through processing. One in 20,000 eggs may be contaminated with *Salmonella* inside the egg shell. Produce such as lettuce, tomatoes, sprouts, and melons can become contaminated with *Salmonella*, *Shigella*, or *Escherichia coli* (*E. coli*) O157:H7. Contamination can occur during growing, harvesting, processing, storing, shipping, or final preparation. Sources of contamination are varied; however, these items are grown in the soil and therefore may become contaminated during growth or through processing and distribution.

Contamination may also occur during food preparation in the restaurant or in the person's kitchen.

When food is cooked and left out for more than 2 hours at room temperature, bacteria can multiply quickly. Most bacteria grow undetected because they do not produce an "off" odor or change the color or texture of the food. Freezing food slows or stops bacteria's growth but does not destroy the bacteria. The microbes can become reactivated when the food is thawed. Refrigeration may slow the growth of some bacteria, but thorough cooking is needed to destroy the bacteria.

Symptoms

In most cases of foodborne illness, symptoms resemble intestinal flu and may last a few hours or even several days. Symptoms can range from mild to serious and include

- Abdominal cramps
- Nausea
- Vomiting
- Diarrhea
- Fever
- Dehydration

Risk Factors

Some people are at greater risk for bacterial infections because of their age or immune status. Young children, pregnant women and their fetuses, the elderly, and people with lowered immunity are at greatest risk.

Complications

Some micro-organisms, such as *Listeria monocytogenes* and *Clostridium botulinum*, cause far more serious illness than vomiting or diarrhea. They can cause spontaneous abortion or death.

In some people, especially children, hemolytic uremic syndrome (HUS) can result from infection by a particular strain of bacteria, *E. coli* O157:H7, and can lead to kidney failure and death. HUS is a rare disorder that affects primarily young children between the ages of 1 and 10 years and is the leading cause of acute renal failure in previously healthy children. The child may become infected after consuming a contaminated food, such as meat (especially undercooked ground beef), unpasteurized apple cider or apple juice, or raw sprouts.

The most common symptoms of infection are vomiting, abdominal pain, and diarrhea, which may be bloody. In 5 to 10 percent of cases, HUS develops about 2 to 6 days after the onset of illness. This disease may last from 1 to 15 days and is fatal in 3 to 5 percent of cases. Symptoms of HUS include fever, lethargy, irritability, and pallor. In about half the cases, the disease progresses until the kidneys are unable to remove waste products from the blood and excrete them into the urine (acute renal failure). A decrease in circulating red blood cells and blood platelets and reduced blood flow to organs may lead to multiple organ failure. Seizures, heart failure, inflammation of the pancreas, and diabetes can also result. However, most children recover completely.

You need to see a doctor right away if you have any of the following symptoms, with or without gastrointestinal symptoms:

- Signs of shock, such as weak or rapid pulse; shallow breathing; cold, clammy, pale skin; shaking or chills; or chest pain.
- Signs of severe dehydration, such as dry mouth, sticky saliva, decreased urine output, dizziness, fatigue, sunken eyes, low blood pressure, or increased heart rate and breathing.
- Confusion or difficulty reasoning.

Diagnosis

Your doctor may be able to diagnose foodborne illness from a list of what you've recently eaten and results from the proper laboratory tests. Diagnostic tests for foodborne illness should include examination of the feces. A sample of the suspected food, if available, can also be tested for bacteria and their toxins as well as for viruses and parasites.

Treatment

Most cases of foodborne illness are mild and can be treated by increasing fluid intake, either orally or intravenously, to replace lost fluids and electrolytes. In cases with gastrointestinal or neurologic symptoms, people should seek medical attention.

In the most severe situations, such as HUS, the patient may need hospitalization in order to receive supportive nutritional and medical therapy. Maintaining adequate fluid and electrolyte balance and controlling blood pressure are important. Doctors will try to minimize the impact of reduced kidney function. Early dialysis is crucial until the kidneys can function normally again, and blood transfusions may be needed.

Prevention

Most cases of foodborne illness can be prevented through proper cooking or processing of food, which kills bacteria. In addition, because bacteria multiply rapidly between 40°F and 140°F, food must be kept out of this “danger zone.”

To prevent harmful bacteria from growing in food, always

- Refrigerate foods promptly. If you let prepared food stand at room temperature for more than 2 hours, it may not be safe to eat. Set your refrigerator at 40°F or lower and your freezer at 0°F.
- Cook food to the appropriate temperature (145°F for roasts, steaks, and chops of beef, veal, and lamb; 160°F for pork, ground veal, and ground beef; 165°F for ground poultry; and 180°F for whole poultry). **Use a thermometer to be sure!** Foods are properly cooked only when they are heated long enough and at a high enough temperature to kill the harmful bacteria that cause illness.
- Prevent cross-contamination. Bacteria can spread from one food product to another throughout the kitchen and can get onto cutting boards, knives, sponges, and countertops. So keep raw meat, poultry, seafood, and their juices away from other foods that are ready to eat.
- Handle food properly. Always wash your hands before touching food and after using the bathroom, changing diapers, or handling pets, as well as after handling raw meat, poultry, fish, shellfish, or eggs. Clean surfaces well before preparing food on them.
- Keep cold food cold and hot food hot.

- Maintain hot cooked food at 140°F or higher.
- Reheat cooked food to at least 165°F.
- Refrigerate or freeze perishables, prepared food, and leftovers within 2 hours.
- Never defrost food on the kitchen counter. Use the refrigerator, cold running water, or the microwave oven.
- Never let food marinate at room temperature; refrigerate it.
- Divide large amounts of leftovers into small, shallow containers for quick cooling in the refrigerator.
- Remove the stuffing immediately from poultry and other meats and refrigerate it in a separate container.
- Do not pack the refrigerator. Cool air must circulate to keep food safe.

Food Irradiation

Food irradiation is the treatment of food with high energy such as gamma rays, electron beams, or x rays as a means of cold pasteurization, which destroys living bacteria, to control foodborne disease. The United States relies exclusively on the use of gamma rays, which are similar to ultraviolet light and microwaves and pass through the food leaving no residue or “radioactivity.” Food irradiation is currently approved for wheat, potatoes, spices, seasonings, pork, poultry, red meats, whole fresh fruits, and dry or dehydrated products. Although irradiation destroys many bacteria, it does not sterilize food. Even if you’re using food that has been irradiated by the manufacturer, you must continue to take precautions against foodborne illness, through proper refrigeration and handling, to safeguard against any surviving organisms.

Links to Other Disorders

Scientists suspect that foodborne pathogens are linked to chronic disorders and can even cause permanent tissue or organ destruction. Research suggests that when some people are infected by foodborne pathogens, the activation of their immune system can trigger an inappropriate autoimmune response, which means the immune system attacks the body's own cells. In some people, an autoimmune response leads to a chronic health condition.

Chronic disorders that may be triggered by foodborne pathogens are

- Arthritis
- Inflammatory bowel disease
- Kidney failure
- Guillain-Barré syndrome
- Autoimmune disorders

Further research is needed to explain the link.

Common Sources of Foodborne Illness

Source of illness: Raw and undercooked meat and poultry.

Symptoms: Abdominal pain, diarrhea, nausea, and vomiting.

Bacteria: *Campylobacter jejuni*, *E. coli* O157:H7, *L. monocytogenes*, *Salmonella*.

Source of illness: Raw (unpasteurized) milk and dairy products, such as soft cheeses.

Symptoms: Nausea and vomiting, fever, abdominal cramps, and diarrhea.

Bacteria: *L. monocytogenes*, *Salmonella*, *Shigella*, *Staphylococcus aureus*, *C. jejuni*.

Source of illness: Raw or undercooked eggs. Raw eggs may not be recognized in some foods such as homemade hollandaise sauce, caesar and other salad dressings, tiramisu, homemade ice cream, homemade mayonnaise, cookie dough, and frostings.

Symptoms: Nausea and vomiting, fever, abdominal cramps, and diarrhea.

Bacteria: *Salmonella enteritidis*.

Source of illness: Raw or undercooked shellfish.

Symptoms: Chills, fever, and collapse.

Bacteria: *Vibrio vulnificus*, *Vibrio parahaemolyticus*.

Source of illness: Improperly canned goods, and smoked or salted fish.

Symptoms: Double vision, inability to swallow, difficulty speaking, and inability to breathe. (Seek medical help right away!)

Bacteria: *C. botulinum*.

Source of illness: Fresh or minimally processed produce.

Symptoms: Diarrhea, nausea, and vomiting.

Bacteria: *E. coli* O157:H7, *L. monocytogenes*, *Salmonella*, *Shigella*, *Yersinia enterocolitica*, viruses, and parasites.

Points To Remember

- Foodborne illness results from eating food that is contaminated with bacteria, viruses, or parasites.
- People at greater risk for foodborne illness include young children, pregnant women and their fetuses, the elderly, and people with lowered immunity.
- Symptoms usually resemble intestinal flu. See a doctor immediately if you have more serious problems, or if you do not seem to be improving as you'd expect.
- Treatment may range from replacement of lost fluids and electrolytes for mild cases of foodborne illness, to hospitalization for severe conditions such as hemolytic uremic syndrome.
- You can prevent foodborne illness by taking the following precautions:
 - Wash your hands with hot, soapy water before preparing food and after using the bathroom or changing diapers.
 - Separate raw meat, poultry, or seafood from other foods to keep these foods and their juices away from ready-to-eat foods.
 - Cook foods properly and at a high enough temperature to kill harmful bacteria.
 - Refrigerate foods within 2 hours or less after cooking because cold temperatures will help keep harmful bacteria from growing and multiplying.
 - Clean surfaces well before using them to prepare foods.

For More Information

U.S. Department of Agriculture
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Meat and Poultry Hotline:
1-800-535-4555
Internet: www.usda.gov

U.S. Department of Health and Human Services
200 Independence Avenue, SW.
Washington, DC 20201
Internet: www.os.dhhs.gov

U.S. Environmental Protection Agency (EPA)
401 M Street, SW.
Washington, DC 20460-0003
Phone: (202) 260-2090
Internet: www.epa.gov

U.S. Food and Drug Administration
FDA (HFE-88)
5600 Fishers Lane
Rockville, MD 20857
Phone: 1-888-INFO-FDA
Internet: www.fda.gov

Center for Food Safety & Applied Nutrition
Food and Drug Administration
200 C Street, SW.
Washington, DC 20204
Food Information Line:
1-800-SAFEFOOD
Internet: vm.cfsan.fda.gov/list.html

Centers for Disease Control and Prevention
1600 Clifton Road
Atlanta, GA 30333
Phone: (404) 639-3534 or 1-800-311-3435
Internet: www.cdc.gov

Gateway to Government Food Safety
Information

Internet: www.FoodSafety.gov

Partnership for Food Safety Education

Internet: www.fightbac.org

American Dietetic Association

216 West Jackson Boulevard

Chicago, IL 60606-6995

Consumer Nutrition Hotline:

1-800-366-1655

Internet: www.eatright.org

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The National Digestive Diseases Information Clearinghouse (NDDIC) is a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The NIDDK is part of the National Institutes of Health under the U.S. Department of Health and Human Services. Established in 1980, the clearinghouse provides information about digestive diseases to people with digestive disorders and to their families, health care professionals, and the public. NDDIC answers inquiries, develops and distributes publications, and works closely with professional and patient organizations and Government agencies to coordinate resources about digestive diseases.

Publications produced by the clearinghouse are carefully reviewed by both NIDDK scientists and outside experts. This fact sheet was also reviewed by Dr. Howard Trachtman of the Long Island Jewish Medical Center, Dr. Peter McNally of the American College of Gastroenterology, and Howard Setter of the Food and Drug Administration.

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