Bacteria and Viruses

Bacteria and viruses are the most common cause of food poisoning. The symptoms and severity of food poisoning vary, depending on which bacteria or virus has contaminated the food.

To prevent illness, always follow the food safety steps: clean, separate, cook, and chill. Other prevention tips for specific bacteria and viruses are included below.

The bacteria and viruses that cause the most illnesses, hospitalizations, or deaths in the United States are described below and include:

- *Campylobacter*
- *Clostridium perfringens*
- *E. coli*
- *Listeria*
- Norovirus
- *Salmonella*

Other important bacteria and viruses that cause foodborne illness include:

- *Bacillus cereus*
- Botulism
- Hepatitis A
- *Shigella*
- *Staphylococcus aureus* (Staphylococcal [Staph] Food Poisoning)
- *Vibrio* Species Causing Vibriosis

Bacillus cereus

Sources	A variety of foods, particularly rice and leftovers, as well as sauces, soups, and other prepared foods that have sat out too long at room temperature.
Incubation period	• Diarrheal: 6-15 hours • Emetic (vomiting): 30 minutes to 6 hours
Symptoms	• Diarrheal: Watery diarrhea and abdominal cramps • Emetic (vomiting): Nausea and vomiting
Duration of illness	24 hours
What to do	Drink plenty of fluids and get rest. If you cannot

	drink enough fluids to prevent dehydration, call your doctor.
Prevention	• If food is to be stored longer than two hours, keep hot foods hot (over 140°F (60°C) and cold foods cold (40°F (4°C) or under) • Store cooked food in a wide, shallow container and refrigerate as soon as possible.

Botulism

Sources	• **Infants**: Honey and products containing honey, such as infant pacifiers filled with or dipped in honey. • **Infants, children and adults**: Improperly home-canned or preserved foods, including low-acid vegetables and fermented fish; improperly canned commercial foods; herb-infused oils, baked potatoes in aluminum foil, cheese sauce, bottled garlic.
Incubation period	• **Infants**: 3-30 days • **Children and adults:** 18-36 hours
Symptoms	• **Infants:** Lethargy, poor feeding, constipation, weak crying, poor muscle tone (appear "floppy"). • **Children and adults:** Double vision, blurred vision, drooping eyelids, slurred speech, difficulty swallowing, dry mouth, and muscle weakness.
Duration of illness	Variable
What to do	Botulism is a medical emergency. If you have symptoms of botulism, see your doctor or go to the emergency room immediately.
Prevention	• Follow safe home canning instructions provided by the National Center for Home Preservation. • Consult with your local Cooperative Extension Service. Most offices have a food safety specialist that can help home canning advice. • Do not feed honey or give honey pacifiers to children younger than 12 months.

Campylobacter

Sources	Unpasteurized (raw) milk, chicken, shellfish, turkey, contaminated water.
Incubation period	2 to 5 days

Symptoms	Diarrhea, cramps, fever, and vomiting; diarrhea may be bloody.
Duration of illness	About one week
What to do	Drink plenty of fluids and get rest. If you cannot drink enough fluids to prevent dehydration or if your symptoms are severe, call your doctor. Antibiotics are recommended only for patients who are very ill or are more likely to develop a serious illness, such as people with weakened immune systems.
Prevention	• Drink pasteurized milk. Do not drink raw milk. • Do not drink untreated water.

Clostridium perfringens

Sources	Beef, poultry, gravies, food left for long periods in steam tables or at room temperature, and time and/or temperature abused foods.
Incubation period	6 to 24 hours
Symptoms	Diarrhea and stomach cramps (no fever or vomiting),
Duration of illness	Less than 24 hours. In severe cases, symptoms may last for 1-2 weeks.
What to do	Drink plenty of fluids and get rest. If you cannot drink enough fluids to prevent dehydration, call your doctor.
Prevention	• Thoroughly cook foods, particularly meat, poultry, and gravies, to a safe internal temperature. • Use a food thermometer to make sure. • Keep food hot after cooking (at 140°F (60°C) or above) and serve meat dishes hot, within 2 hours after cooking. • Microwave leftovers thoroughly (to 165°F (74°C) or above). • Refrigerate leftovers within two hours of preparation (at 40°F (4°C) or below). • Divide large amounts of food, such as roasts or big pots of chili or stew, into shallow containers and refrigerate immediately. It is OK to put hot foods directly in the refrigerator.

E. coli

Sources	• Contaminated food, especially undercooked ground beef, unpasteurized (raw) milk and juice, soft cheeses made

	from raw milk, and raw fruits and vegetables (such as lettuce, other leafy greens, and sprouts). • Contaminated water, including drinking untreated water and swimming in contaminated water. • Animals and their environment, particularly cows, sheep, and goats. • Feces of infected people.
Incubation period	3 to 4 days for most people, can be 1 to 10 days
Symptoms	• Severe diarrhea that is often bloody, severe stomach pain, and vomiting. Usually little or no fever is present. • Symptoms of hemolytic uremic syndrome (HUS) include decreased urine production, dark or tea-colored urine, and losing pink color in cheeks and inside the lower eyelids.
Duration of illness	5 to 10 days. Most people will be better in 5 to 7 days. If HUS develops, it usually occurs after about 1 week.
What to do	Drink plenty of fluids and get rest. If you cannot drink enough fluids to prevent dehydration or if your symptoms are severe (including bloody diarrhea or severe stomach pain), call your doctor.
Prevention	• Avoid eating high-risk foods, especially undercooked ground beef, unpasteurized milk or juice, soft cheeses made from unpasteurized milk, or sprouts. • Use a food thermometer to make sure that ground beef has reached a safe internal temperature of 160°F (71°C). • Wash hands before, during, and after preparing food, after diapering infants, and after contact with cows, sheep, or goats, their food or treats, or their living environment.

Hepatitis A

Sources	Raw or undercooked shellfish from contaminated waters, raw produce, contaminated drinking water, uncooked foods, and cooked foods that are not reheated after contact with an infected food handler.
Incubation period	28 days average (ranges from 15 to 50 days)
Symptoms	Diarrhea, dark urine or light-colored stools,

	jaundice, fever, fatigue, nausea, joint pain, stomach pain, upset stomach, and loss of appetite.
Duration of illness	Symptoms usually last less than 2 months, although some people can be ill for as long as 6 months.
What to do	See your doctor if you have signs or symptoms of hepatitis A or think you may have been exposed to the virus.

Prevention	• Avoid eating raw oysters or other raw or undercooked shellfish.
	• Wash hands frequently with soap and running water for at least 20 seconds, particularly after using the bathroom, after changing diapers, and before, during, and after preparing food.
	• Vaccination is the best way to prevent hepatitis A. Hepatitis A vaccination is recommended for:
	  ◦ All children at age 1 year
	  ◦ People with direct contact with others who have hepatitis A
	  ◦ People with chronic or long-term liver disease
	  ◦ People with clotting-factor disorders
	  ◦ Travelers to countries where hepatitis A is common
	  ◦ Men who have sexual encounters with other men
	  ◦ People who use or inject drugs
	  ◦ People experiencing homelessness

Listeria

Sources	• Unpasteurized (raw) milk and dairy products. • Any type of cheese made with unpasteurized (raw) milk. • Unheated queso fresco-type cheeses, when made with pasteurized or unpasteurized (raw) milk or similar fresh, soft cheeses such as queso blanco and requesón. • Raw fruits and vegetables (such as sprouts). • Ready-to-eat deli meats and hot dogs. • Refrigerated pâtés or meat spreads. • Refrigerated smoked seafood.
Incubation period	Usually 1 to 4 weeks, can be as long as 70 days

Symptoms	*Listeria* can cause fever and diarrhea similar to other foodborne germs, but this type of *Listeria* infection is rarely diagnosed. Symptoms in people with invasive listeriosis, meaning the bacteria has spread beyond the gut, include: • For pregnant women: fever, fatigue and muscle aches. Pregnant women may also have no symptoms but experience fetal death, pre-term labor, or infection of the newborn. • For all others, stiff neck, confusion, loss of balance, and convulsions in addition to fever and muscle aches.
Duration of illness	Days to weeks
Who is at risk	• Adults age 65 and older • Pregnant women and their newborns • People whose immune systems are weakened due to illness or medical treatment
What to do	For invasive listeriosis, antibiotics given promptly can cure the infection. In pregnant women, antibiotics are given to prevent infection in the unborn baby.
Prevention	Recommendations for everyone: • Do not drink raw (unpasteurized) milk, and do not eat soft cheeses made with raw milk, such as queso fresco. • Eat cut melon right away or refrigerate it. In addition to recommendations for everyone, people at higher risk should avoid the following foods: • Refrigerated pâtés or meat spreads from a deli or meat counter or from the refrigerated section of a store • Hot dogs, cold cuts, and deli meats, unless they are heated to an internal temperature of 165°F (74°C) or until steaming hot before eating. • Refrigerated smoked seafood, unless it is canned or shelf-stable or it is in a cooked dish, such as a casserole • Raw or lightly cooked sprouts of any kind • Any type of cheese made with unpasteurized (raw) milk

	• Unheated queso fresco-type cheeses, when made with pasteurized or unpasteurized (raw) milk or similar fresh, soft cheeses such as queso blanco and, requesón Queso fresco-type cheeses have caused Listeria outbreaks. Safer cheese choices, especially for pregnant women, include: • Hard cheeses, when made with pasteurized milk, such as Asiago, Cheddar, Parmesan, or Swiss/Gruyere/Emmental • Cottage cheese, cream cheese, string cheese, feta, and mozzarella, when made with pasteurized milk • Heated queso fresco-type cheeses or heated unpasteurized (raw) milk cheeses, when heated to 165°F or until steaming hot

Norovirus

Sources	Produce, shellfish, ready-to-eat foods touched by infected food workers (salads, sandwiches, ice, cookies, fruit), or any other foods contaminated with particles of vomit or feces from an infected person.
Incubation period	12 to 48 hours
Symptoms	Diarrhea, vomiting, nausea, and stomach pain. Diarrhea tends to be watery and non-bloody. Diarrhea is more common in adults and vomiting is more common in children.
Duration of illness	1 to 3 days. Among young children, older adults, and hospitalized patients, it can last 4 to 6 days.
What to do	Drink plenty of fluids and get rest. If you cannot drink enough fluids to prevent dehydration, call your doctor.
Prevention	• Wash hands frequently with soap and running water for at least 20 seconds, particularly after using the bathroom and before, during, and after preparing food. • If you work in a restaurant or deli, avoid bare-hand contact with ready-to-eat foods. • Clean and disinfect surfaces contaminated by vomit or diarrhea (use a bleach-based household cleaner as directed on the label). Clean and disinfect food preparation equipment and surfaces.

	• If you are ill with diarrhea or vomiting and for two days afterwards, do not cook, prepare, or serve food for others. • Wash fruits and vegetables and cook oysters and other shellfish thoroughly before eating them. • Wash clothing or linens soiled by vomit or fecal matter immediately. Remove the items carefully to avoid spreading the virus. Machine wash and dry.

Salmonella

Sources	**Food:** A variety of foods have been linked to Salmonella, including vegetables, chicken, pork, fruits, nuts, eggs, beef and sprouts. **Animals and their environments:** Particularly reptiles (snakes, turtles, lizards), amphibians (frogs), birds (baby chicks) and pet food and treats.
Incubation period	6 hours to 6 days
Symptoms	Diarrhea, fever, stomach cramps, vomiting
Duration of illness	4 to 7 days
What to do	Drink plenty of fluids and get rest. If you cannot drink enough fluids to prevent dehydration or if your symptoms are severe, call your doctor. Antibiotics are recommended only for patients who have a serious illness (such as severe diarrhea, high fever, or bloodstream infection), or are more likely to develop a severe illness or complications (infants, adults over 65 years old, and people with weakened immune systems).
Prevention	• Avoid eating high-risk foods, including raw or lightly cooked eggs, undercooked ground beef or poultry, and unpasteurized (raw) milk. • Wash your hands after contact with animals, their food or treats, or their living environment.

Shigella

Sources	Contact with an infected person or consumption of contaminated food or water. *Shigella* foodborne outbreaks are most often associated with contamination by a sick food handler.
Incubation period	1 to 7 days (usually 1 to 2 days)
Symptoms	Sudden stomach cramping, fever, diarrhea that

	may be bloody or contains mucus, nausea, and feeling the need to pass stool even when the bowels are empty.
Duration of illness	5 to 7 days
Who's at risk?	Children, especially toddlers aged 2-4, though anyone can be infected with Shigella.
What to do	Drink plenty of fluids and get rest. Stay home from school or work to avoid spreading the bacteria to others. If you cannot drink enough fluids to prevent dehydration or have bloody diarrhea, call your doctor.
Prevention	• Wash hands with soap carefully and frequently, especially after going to the bathroom, after changing diapers, and before preparing foods or beverages. • Stay home from healthcare, food service, or childcare jobs while sick or until your health department says it's safe to return. • Keep children with diarrhea out of child care settings and school while they are ill. • Dispose of soiled diapers properly. • Disinfect diaper changing areas after using them. • Supervise handwashing of toddlers and small children after they use the toilet. • Do not prepare food for others while ill with diarrhea • Avoid swallowing water from ponds, lakes, or untreated pools. • Avoid having sex (vaginal, anal, or oral) for one week after you no longer have diarrhea. • When traveling in developing countries, drink only treated or boiled water, and eat only cooked hot foods or fruits you peel yourself.

Staphylococcus aureus
Staphylococcal (Staph) Food Poisoning

Sources	People who carry the bacteria *Staphylococcus aureus* (Staph), which is commonly found on the skin, can contaminate food if they don't wash their hands before touching it. Foods that are not cooked after handling, such as sliced meats, puddings, pastries, and sandwiches, are especially risky if contaminated with Staph.
Incubation period	30 minutes to 8 hours
Symptoms	Sudden start of nausea, vomiting, and stomach cramps. Most people also have diarrhea.

Duration of illness	1 day
What to do	Drink plenty of fluids. If you cannot drink enough fluids to prevent dehydration, call your doctor. Your doctor may give you medicine to decrease nausea and vomiting.
Prevention	• Use a food thermometer and cook foods to their safe minimum internal temperature. • Keep hot foods hot (140°F (60°C) or hotter) and cold foods cold (40°F (4°C) or colder). • Store cooked food in shallow containers and refrigerate within 2 hours (or 1 hour if it's hotter than 90°F (32°C) outside). • Wash your hands for 20 seconds with soap and water before, during, and after preparing food, and before eating. • Do not prepare food if you are ill with diarrhea or vomiting. • Wear gloves while preparing food if you have wounds or infections on your hands or wrists.

Vibrio Species Causing Vibriosis

Sources	Most people become infected by eating raw or undercooked shellfish, particularly oysters. Certain *Vibrio* species can also cause a skin infection when an open wound is exposed to salt water or brackish water. Brackish water is a mixture of fresh water and salt water. It is often found where rivers meet the sea.
Incubation period	• Vibrio wound infection: 1–7 days • Gastrointestinal illness: 2–48 hours
Symptoms	• **In healthy people:** Diarrhea, vomiting, abdominal pain • **In high-risk people:** Sudden chills, fever, shock, skin lesions
Duration of illness	3 days, when spread through food. Duration of wound infections is variable.
What to do	If you have symptoms within a few days after eating raw or undercooked seafood, especially oysters, or develop a skin infection after being exposed to salt water or brackish water, contact your doctor. **Don't chance it!** Some *Vibrio* species, such as *Vibrio vulnificus*, can cause particularly severe and life-threatening infections.
Prevention	• Don't eat raw or undercooked oysters or other shellfish. Cook them before eating. • Always wash your hands with soap and water after handing raw shellfish.

- Avoid contaminating cooked shellfish with raw shellfish and its juices.
- Stay out of salt water or brackish water if you have a wound (including cuts and scrapes), or cover your wound with a waterproof bandage if there's a possibility it could come into contact with salt water or brackish water, raw seafood, or raw seafood juices.
- Wash wounds and cuts thoroughly with soap and water if they have been exposed to seawater or raw seafood or its juices.

If you are in a group more likely to get a *Vibrio* infection, such as people with liver disease:

- Wear clothes and shoes that can protect you from cuts and scrapes when in salt water or brackish water.
- Wear protective gloves when handling raw seafood.

General Information

About Food Safety: Foodborne Illnesses and Germs (CDC)

Bad Bug Book (FDA)

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