



## FOODBORNE PATHOGENS AND ILLNESSES



According to the Centers for Disease Control and Prevention (CDC) estimates, one in six, or 48 million Americans will contract a foodborne illness this year. Most healthy individuals will experience mild to moderate symptoms like diarrhea or vomiting depending on the specific organism. However, individuals with weakened immune systems, the very young, and the elderly are most susceptible to severe illnesses like blood infections, paralysis, and organ failure. CDC estimates that nationally, nearly 128,000 people will be hospitalized and 3,000 people will die as a result of a foodborne illness infection.

There are 31 primary foodborne pathogens known to cause illness in humans. The table below summarizes ten of the more common foodborne pathogens. Included in the chart are descriptions of the associated illnesses, onset time of symptoms, duration of illnesses, and the foods commonly associated with the illnesses.

Organism	Description of Illness	Symptoms	Onset of Symptoms and Duration of Illness
<b><i>Campylobacter</i></b>	<p><i>Campylobacter</i> is a type of bacteria which causes a gastrointestinal disease called Campylobacteriosis. It is one of the leading causes of foodborne illness in the United States.</p> <p><b>Commonly associated foods:</b> raw/undercooked poultry, raw (under-pasteurized) milk, untreated water</p>	<p>Symptoms of campylobacteriosis include diarrhea, abdominal cramps, and fever. Most people with campylobacteriosis recover completely. However, a small percentage of people may have joint pain and swelling after infection. In addition, a rare disease called Guillain-Barre syndrome that causes weakness and paralysis can occur several weeks after the initial illness.</p>	<p>Symptoms typically develop within two to five days after exposure and last about a week.</p>
<b><i>Clostridium botulinum</i></b>	<p>This bacterium is found throughout the environment and is responsible for the three main kinds of botulism: Foodborne botulism which is caused by eating foods that contain the toxin; Wound botulism which is caused by toxin formation within an infected wound; and Infant botulism which is caused by consumption of the spores of the pathogen by infants.</p> <p><b>Commonly associated foods:</b> improperly processed home-canned foods such as asparagus, green beans, beets and corn; occasionally associated with commercially canned foods and herb infused oils.</p>	<p>Symptoms include blurred vision, double vision, drooping eyelids with paralysis progressing downwards.</p>	<p>Foodborne botulism symptoms typically start within 18 to 36 hours of exposure to the toxin.</p> <p>If treated promptly with botulinum antitoxin, symptoms can be reversed within a few days. However, severe cases can lead to paralysis of respiratory muscles.</p>

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<b><i>Cyclospora cayetanensis</i></b>	<p>This is a single-celled parasite which is common in the tropics. Although there are many species of <i>Cyclospora</i>, only <i>C. cayetanensis</i> has been observed to cause illness in humans.</p> <p><b>Commonly associated foods:</b> fresh produce harvested from tropical regions such as raspberries, basil, and several varieties of lettuce</p>	<p>Symptoms include diarrhea (sometimes explosive), weight loss, nausea, and tiredness. In severe cases, flu-like symptoms may develop.</p>	<p>Some individuals will exhibit no symptoms while others will have mild symptoms within a week of exposure. Without treatment, symptoms can persist intermittently for months.</p>
<b><i>E. coli</i> O157:H7</b>	<p><i>Escherichia coli</i> is one of a group bacteria found in the intestines of healthy humans and animals. Certain serotypes of <i>E.coli</i>, such as <i>E. coli</i> O157:H7, produce shiga-toxins which can cause severe infections.</p> <p><b>Commonly associated foods:</b> ground meats, raw or under-pasteurized milk and juices, lettuce, spinach, sprouts, contaminated water</p>	<p>Infection with <i>E. coli</i> O157:H7 can result in diarrhea, cramping, vomiting, bloody diarrhea, blood clotting problems, and in some cases, death.</p> <p>The infection can also cause a complication called hemolytic uremic syndrome (HUS), in which the red blood cells are destroyed and the kidneys fail. Approximately two to seven percent of infections lead to this complication.</p>	<p>Symptoms usually begin three to four days after exposure to the organism and lasts five to 10 days. Complications associated with HUS can lead to kidney failure and death.</p>
<b>Hepatitis A</b>	<p>Hepatitis A is a virus which can be transmitted by contaminated food, water, and other surfaces including contaminated hands.</p> <p><b>Commonly associated foods:</b> shellfish, berries, salads, contaminated water</p>	<p>The virus causes inflammation of the liver and may include fever, loss of appetite, nausea, vomiting, yellowing of the whites of the eyes and skin (jaundice). Thorough handwashing is an important step to prevent the spread of the virus since it can be spread through person to person contact.</p>	<p>Symptoms from the illness are usually mild and start two to four weeks after exposure. Usually, symptoms go away within two weeks, but can last up to six months in some individuals.</p>

Organism	Description of Illness	Symptoms	Onset of Symptoms and Duration of Illness
<b>Listeria monocytogenes</b>	<p>This bacterium is the organism which causes listeriosis. It is a salt tolerant pathogen found in nature which can grow under refrigerated temperatures. It can thrive where most foodborne pathogens cannot and is notable for its persistence in many food manufacturing environments.</p> <p><b>Commonly associated foods:</b> raw or under-pasteurized milk, smoked fish, deli meats and cheeses, raw vegetables</p>	<p>Symptoms caused range from nausea, vomiting, and muscle aches in mild cases, to meningitis when the infection has spread. Pregnant women are about 20 times more likely than other healthy adults to get listeriosis. Although they may only experience mild, flu-like symptoms, infections during pregnancy can lead to miscarriage, still birth, premature delivery, or infection of the newborn.</p>	<p>There are two forms of the illness caused by <i>L. monocytogenes</i>. Non-invasive gastrointestinal illness usually begins within a few hours to three days of exposure. Victims of the more serious invasive form of the illness which may cause septicemia and meningitis may take up to three months to exhibit symptoms.</p>
<b>Norovirus</b>	<p>Noroviruses are a class of viruses which are the leading cause of foodborne illness. The viruses can be transmitted through contaminated food and water but also spread from person to person contact and through contact with contaminated surfaces. Outbreaks of noroviruses have been noted in crowded living situations like dormitories, nursing homes, day care centers and cruise ships. Since alcohol-based antibacterial hand gels are not effective against noroviruses, thorough handwashing is important to stop the spread of the illness from person to person.</p> <p><b>Commonly associated foods:</b> fruits, vegetables, meats, oysters harvested from contaminated waters.</p>	<p>Symptoms may include explosive, projectile vomiting, watery diarrhea, and cramping.</p>	<p>Symptoms usually begin within 12 hours to two days of exposure to the virus. Most individuals get better within 24 to 48 hours. Some patients will become severely dehydrated and require extra fluids and electrolyte therapy.</p>
<b>Salmonella</b>	<p>This bacteria lives in the intestines of some animals and is shed in their feces. Salmonellosis, the disease caused by <i>Salmonella</i> is one of the most common gastrointestinal infections in the United States with approximately 4,500 cases reported in California every year.</p> <p><b>Commonly associated foods:</b> meats, eggs, fruits, spices, melons, raw/untreated tree nuts. The illness has also been traced back to pets like turtles, reptiles and chicks.</p>	<p>Symptoms include nausea, vomiting, diarrhea, cramps, and fever.</p>	<p>Symptoms usually begin within 12 to 72 hours of exposure. In the gastrointestinal form of the illness, symptoms usually go away within a week, although long term symptoms such as joint pain, eye irritation, and painful urination may persist.</p>

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<p><b><i>Staphylococcus aureus</i></b></p>	<p>This pathogen is very common in the environment and on humans and animals. If allowed to grow and multiply at room temperature on food, <i>S. aureus</i> can produce a harmful, heat stable toxin on food. The toxin cannot be “cooked out” of food and will cause illness if ingested in high amounts.</p> <p><b>Commonly associated foods:</b> foods which require extensive handling during preparation including cooked meat products; egg products; salads such as tuna chicken, potato, macaroni; cream filled pastries; dairy products</p>	<p>Symptoms include nausea, stomach cramps, vomiting, diarrhea, temporary changes in blood pressure and heart rate.</p>	<p>If consumed in high concentrations, symptoms may develop rapidly, within one to seven hours. Symptoms typically last from a few hours to one day.</p>
<p><b><i>Vibrio parahaemolyticus</i> and <i>Vibrio vulnificus</i></b></p>	<p><i>Vibrio parahaemolyticus</i> and <i>Vibrio vulnificus</i> are bacteria that are part of the same microbiological family. While many types of <i>Vibrio</i> are non-pathogenic, both of these can cause illness in humans. <i>V. parahaemolyticus</i> and <i>V. vulnificus</i> are a naturally occurring bacteria commonly found in the waters off the coastal regions of the North America. They grow and thrive in warm water during the summer months.</p> <p><b>Commonly associated foods:</b> raw/undercooked shellfish, especially oysters.</p>	<p>Both pathogens can cause diarrhea, cramps, fever, nausea and vomiting in healthy individuals. However, blood infections (known as sepsis) and infections in other parts of the body can occur in individuals with weakened immune systems, liver disease, or taking medication meant to lower the actions of the immune system. Additionally, <i>V. vulnificus</i> has been known to cause wound infections when a pre-existing wound is exposed to the bacteria while swimming in marine waters harboring the organism. <i>V. vulnificus</i> wound infections can be severe and life-threatening.</p>	<p><i>V. parahaemolyticus</i> - Symptoms usually occur within 24 hours of exposure and lasts for three days.</p> <p><i>V. vulnificus</i> – Gastroenteritis symptoms occur 12 hours to 21 days after exposure and is usually self-limiting in otherwise healthy adults. If the infection spreads to the blood, approximately 35% of case patients die.</p>

Additional Information may be found at:

- California Department of Public Health - <https://www.cdph.ca.gov/HealthInfo/discond/Pages/default.aspx>
- United States Food and Drug Administration - <http://www.fda.gov/Food/FoodbornellnessContaminants/CausesOfIllnessBadBugBook/>