

## Additional Organisms That Cause Foodborne Illness

### Bacteria

**Bacteria** *Bacillus cereus* (ba-SIL-us SEER-ee-us)

**Illness** *Bacillus cereus gastroenteritis* (ba-SIL-us SEER-ee-us GAS-tro-EN-ter-I-tiss)

*Bacillus cereus* is a spore-forming bacteria found in dirt. It can produce two different toxins when allowed to grow to high levels. The toxins cause different illnesses.

#### Food Commonly Linked with the Bacteria

Diarrhea illness

- Cooked vegetables
- Meat products
- Milk

Vomiting illness

- Cooked rice dishes, including fried rice and rice pudding

#### Most Common Symptoms

Diarrhea illness

- Watery diarrhea
- No vomiting

Vomiting illness

- Nausea
- Vomiting

#### Prevention Measures

- Cook food to minimum internal temperatures.
- Hold food at the correct temperatures.
- Cool food correctly.
- Control time and temperature.

**Bacteria** *Listeria monocytogenes* (liss-TEER-ee-uh MON-o-SI-TAHJ-uh-nee-z)

**Illness** *Listeriosis* (liss-TEER-ee-O-sis)

*Listeria monocytogenes* is found in dirt, water, and plants. Unlike other bacteria, it grows in cool, moist environments. The illness is uncommon in healthy people, but high-risk populations are especially vulnerable—particularly pregnant women.

#### Food Commonly Linked with the Bacteria

- Raw meat
- Unpasteurized dairy products
- Ready-to-eat food, such as deli meat, hot dogs, and soft cheeses

#### Most Common Symptoms

Pregnant women

- Miscarriage

Newborns

- Sepsis
- Pneumonia
- Meningitis

#### Prevention Measures

- Throw out any product that has passed its use-by or expiration date.
- Cook raw meat to minimum internal temperatures.
- Prevent cross-contamination between raw or undercooked food and ready-to-eat food.
- Avoid using unpasteurized dairy products.
- Control time and temperature.

**Bacteria** Enterohemorrhagic and shiga toxin-producing *Escherichia coli* (*ess-chur-EE-kee-UH KO-LI*), including O157:H7, O26:H11, O111:H8, and O158:NM

**Illness** Hemorrhagic colitis (*hem-or-RA-jik ko-LI-tiss*)

Enterohemorrhagic and shiga toxin-producing *E. coli* can be found in the intestines of cattle. It is also found in infected people. The bacteria can contaminate meat during slaughtering. Eating only a small amount of the bacteria can make a person sick. Once eaten, it produces toxins in the intestines, which causes the illness. The bacteria are often in a person’s feces for weeks after symptoms have ended.

**Food Commonly Linked with the Bacteria**

- Ground beef (raw and undercooked)
- Contaminated produce

**Most Common Symptoms**

- Diarrhea (eventually becomes bloody)
- Abdominal cramps
- Kidney failure (in severe cases)

**Prevention Measures**

- Cook food, especially ground beef, to minimum internal temperatures.
- Purchase produce from approved, reputable suppliers.
- Prevent cross-contamination between raw meat and ready-to-eat food.
- Keep staff with diarrhea out of the operation.
- Keep staff who have been diagnosed with hemorrhagic colitis out of the operation.
- Control time and temperature.

**Bacteria** *Clostridium perfringens*

**Illness** *Clostridium perfringens* gastroenteritis (*klos-TRID-ee-um per-FRIN-jins GAS-tro-EN-ter-l-tiss*)

*Clostridium perfringens* is found in dirt, where it forms spores that allow it to survive. It is also carried in the intestines of both animals and humans.

*Clostridium perfringens* does not grow at refrigeration temperatures. It does grow rapidly in food in the temperature danger zone. Commercially prepped food is not often involved in outbreaks. People who get sick usually do not have nausea, fever, or vomiting.

**Food Commonly Linked with the Bacteria**

- Meat
- Poultry
- Dishes made with meat and poultry, such as stews and gravies

**Most Common Symptoms**

- Diarrhea
- Severe abdominal pain

**Prevention Measures**

- Cool and reheat food correctly.
- Hold food at the correct temperatures.
- Control time and temperature.

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**Bacteria** *Clostridium botulinum* (klos-TRID-ee-um BOT-chew-LINE-um)**Illness** **Botulism** (BOT-chew-liz-um)

*Clostridium botulinum* forms spores that are often found in water and dirt. These spores can contaminate almost any food. The bacteria do not grow well in refrigerated or highly acidic food or in food with low moisture. However, *Clostridium botulinum* grows without oxygen and can produce a lethal toxin when food is time-temperature abused. Without medical treatment, death is likely.

**Food Commonly Linked with the Bacteria**

- Incorrectly canned food
- Reduced-oxygen packaged (ROP) food
- Temperature-abused vegetables, such as baked potatoes
- Untreated garlic-and-oil mixtures

**Most Common Symptoms**

- Initially
- Nausea and vomiting
- Later
- Weakness
  - Double vision
  - Difficulty in speaking and swallowing

**Prevention Measures**

- Hold, cool, and reheat food correctly.
- Inspect canned food for damage.
- Control time and temperature.

**Bacteria** *Campylobacter jejuni* (Camp-ee-lo-BAK-ter jay-JUNE-ee)**Illness** **Campylobacteriosis** (CAMP-ee-lo-BAK-teer-ee-O-sis)

Though *Campylobacter jejuni* is commonly associated with poultry, it has been known to contaminate water. Illness often occurs when poultry is incorrectly cooked and when raw poultry has been allowed to cross-contaminate other food and food-contact surfaces. Campylobacteriosis is best controlled through correct cooking and the prevention of cross-contamination.

**Food Commonly Linked with the Bacteria**

- Poultry
- Water contaminated with the bacteria
- Meats
- Stews/gravies

**Most Common Symptoms**

- Diarrhea (may be watery or bloody)
- Abdominal cramps
- Fever
- Vomiting
- Headaches

**Prevention Measures**

- Cook food, particularly poultry, to required minimum internal temperatures.
- Prevent cross-contamination between raw poultry and ready-to-eat food.
- Control time and temperature.

**Bacteria** *Salmonella* spp. (SAL-me-NEL-uh)**Illness** **Salmonellosis** (SAL-men-uh-LO-sis)

Many farm animals carry *Salmonella* spp. naturally. Eating only a small amount of these bacteria can make a person sick. How severe symptoms are depends on the health of the person and the amount of bacteria eaten. The bacteria are often in a person's feces for weeks after symptoms have ended.

**Food Commonly Linked with the Bacteria**

- Poultry and eggs
- Dairy products
- Produce

**Most Common Symptoms**

- Diarrhea
- Abdominal cramps
- Vomiting
- Fever

**Prevention Measures**

- Cook poultry and eggs to minimum internal temperatures.
- Prevent cross-contamination between poultry and ready-to-eat food.
- Keep food handlers who have been diagnosed with salmonellosis out of the operation.

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**Bacteria** *Salmonella Typhi* (SAL-me-NEL-uh Ti-fee)

**Illness** Typhoid fever

*Salmonella Typhi* lives only in humans. People with typhoid fever carry the bacteria in their bloodstream and intestinal tract. Eating only a small amount of these bacteria can make a person sick. The severity of symptoms depends on the health of the person and the amount of bacteria eaten. The bacteria are often in a person’s feces for weeks after symptoms have ended.

**Food Commonly Linked with the Bacteria**

- Ready-to-eat food
- Beverages

**Most Common Symptoms**

- High fever
- Weakness
- Abdominal pain
- Headache
- Loss of appetite
- Rash

**Prevention Measures**

- Exclude food handlers who have been diagnosed with an illness caused by *Salmonella Typhi* from the operation.
- Wash hands.
- Cook food to minimum internal temperatures.
- Prevent cross-contamination.

**Bacteria** *Shigella spp.* (shi-GEL-uh)

**Illness** Shigellosis (SHIG-uh-LO-sis)

*Shigella spp.* is found in the feces of humans with the illness. Most illnesses occur when people eat or drink contaminated food or water. Flies can also transfer the bacteria from feces to food. Eating only a small amount of these bacteria can make a person sick. High levels of the bacteria are often in a person’s feces for weeks after symptoms have ended.

**Food Commonly Linked with the Bacteria**

- Food that is easily contaminated by hands, such as salads containing TCS food (potato, tuna, shrimp, macaroni, and chicken)
- Food that has made contact with contaminated water, such as produce

**Most Common Symptoms**

- Bloody diarrhea
- Abdominal pain and cramps
- Fever (occasionally)

**Prevention Measures**

- Exclude food handlers who have been diagnosed with an illness caused by *Shigella spp.* from the operation.
- Exclude food handlers who have diarrhea from the operation.
- Wash hands.
- Control flies inside and outside the operation.
- Practice personal hygiene.

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**Bacteria** *Staphylococcus aureus* (STAF-uh-lo-KOK-us OR-ee-us)

**Illness** **Staphylococcal gastroenteritis** (STAF-ul-lo-KOK-al GAS-tro-EN-ter-I-tiss)

*Staphylococcus aureus* can be found in humans—particularly in the hair, nose, and throat; and in infected cuts. It is often transferred to food when people carrying it touch these areas on their bodies and then handle food without washing their hands. If allowed to grow to large numbers in food, the bacteria can produce toxins that cause the illness when eaten. Cooking cannot destroy these toxins, so preventing bacterial growth is critical.

**Food Commonly Linked with the Bacteria**

Food that requires handling during prepping

- Salads containing TCS food (egg, tuna, chicken, and macaroni)
- Deli meat

**Most Common Symptoms**

- Nausea
- Vomiting and retching
- Abdominal cramps

**Prevention Measures**

- Wash hands, particularly after touching the hair, face, or body.
- Cover wounds on hands and arms.
- Hold, cool, and reheat food correctly.
- Practice personal hygiene.

**Bacteria** *Vibrio vulnificus* and *Vibrio parahaemolyticus* (VIB-ree-o vul-NIF-ih-kus and VIB-ree-o PAIR-uh-HEE-mo-lit-ih-kus)

**Illnesses** ***Vibrio* gastroenteritis** (VIB-ree-o GAS-tro-EN-ter-I-tiss)

***Vibrio vulnificus* primary septicemia** (VIB-ree-o vul-NIF-ih-kus SEP-ti-SEE-mee-uh)

These bacteria are found in the waters where shellfish are harvested. They can grow very rapidly at temperatures in the middle of the temperature danger zone. People with chronic conditions (such as diabetes or cirrhosis) who become sick from these bacteria may get primary septicemia. This severe illness can lead to death.

**Food Commonly Linked with the Bacteria**

- Oysters from contaminated water

**Most Common Symptoms**

- Diarrhea
- Abdominal cramps and nausea
- Vomiting
- Low-grade fever and chills

**Prevention Measures**

- Cook oysters to minimum internal temperatures.
- Purchase from approved, reputable suppliers.

## Viruses

### Virus Hepatitis A (*HEP-a-TI-tiss*)

#### Illness Hepatitis A

Hepatitis A is mainly found in the feces of people infected with it. The virus can contaminate water and many types of food. It is commonly linked with ready-to-eat food. However, it has also been linked with shellfish from contaminated water.

The virus is often transferred to food when infected food handlers touch food or equipment with fingers that have feces on them. Eating only a small amount of the virus can make a person sick. An infected person may not show symptoms for weeks but can be very infectious. Cooking does not destroy hepatitis A.

#### Food Commonly Linked with the Virus

- Ready-to-eat food
- Shellfish from contaminated water

#### Most Common Symptoms

- Fever (mild)
- General weakness
- Nausea
- Abdominal pain
- Jaundice (appears later)

#### Prevention Measures

- Exclude staff who have been diagnosed with hepatitis A from the operation.
- Exclude staff who have jaundice from the operation.
- Wash hands.
- Avoid bare-hand contact with ready-to-eat food.
- Purchase shellfish from approved, reputable suppliers.
- Practice personal hygiene.

### Virus Norovirus (*NOR-o-VI-rus*)

#### Illness Norovirus gastroenteritis

Like hepatitis A, Norovirus is commonly linked with ready-to-eat food. It has also been linked with contaminated water. Norovirus is often transferred to food when infected food handlers touch food or equipment with fingers that have feces on them.

Eating only a small amount of Norovirus can make a person sick. It is also very contagious. People become contagious within a few hours after eating it. The virus is often in a person's feces for days after symptoms have ended.

#### Food Commonly Linked with the Virus

- Ready-to-eat food
- Shellfish from contaminated water

#### Most Common Symptoms

- Vomiting
- Diarrhea
- Nausea
- Abdominal cramps

#### Prevention Measures

- Exclude staff who have been diagnosed with Norovirus from the operation.
- Exclude staff with diarrhea and vomiting from the operation.
- Wash hands.
- Avoid bare-hand contact with ready-to-eat food.
- Purchase shellfish from approved, reputable suppliers.
- Practice personal hygiene.

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## Parasites

**Parasite** *Anisakis simplex* (ANN-ih-SAHK-iss SIM-plex)

**Illness** **Anisakiasis** (ANN-ih-SAH-KYE-ah-sis)

People can get sick when they eat raw or undercooked fish containing this parasite.

### Food Commonly Linked with the Parasite

Raw and undercooked fish

- Herring
- Cod
- Halibut
- Mackerel
- Pacific salmon

### Most Common Symptoms

- Tingling in throat
- Coughing up worms

### Prevention Measures

- Cook fish to minimum internal temperatures.
- If serving raw or undercooked fish, purchase sushi-grade fish that has been frozen to the correct time-temperature requirements.
- Purchase from approved, reputable suppliers.

**Parasite** *Cryptosporidium parvum* (KRIP-TOH-spor-ID-ee-um PAR-vum)

**Illness** **Cryptosporidiosis** (KRIP-TOH-spor-id-ee-O-sis)

*Cryptosporidium parvum* can be found in the feces of infected people. Food handlers can transfer it to food when they touch food with fingers that have feces on them. Day-care and medical communities have been frequent locations of person-to-person spread of this parasite. Symptoms will be more severe in people with weakened immune systems.

### Food Commonly Linked with the Parasite

- Contaminated water
- Produce

### Most Common Symptoms

- Watery diarrhea
- Abdominal cramps
- Nausea
- Weight loss

### Prevention Measures

- Use correctly treated water.
- Keep food handlers with diarrhea out of the operation.
- Wash hands.
- Purchase from approved, reputable suppliers.

**Parasite** *Giardia duodenalis* (jee-ARE-dee-uh do-WAH-den-AL-is), also known as *G. lamblia* or *G. intestinalis*

**Illness** **Giardiasis** (JEE-are-DYE-uh-sis)

*Giardia duodenalis* can be found in the feces of infected people. Food handlers can transfer the parasite to food when they touch food with fingers that have feces on them.

### Food Commonly Linked with the Parasite

- Incorrectly treated water
- Produce

### Most Common Symptoms

- Initially
- Fever
- Later
- Diarrhea
  - Abdominal cramps
  - Nausea

### Prevention Measures

- Use correctly treated water.
- Keep food handlers with diarrhea out of the operation.
- Wash hands.
- Purchase from approved, reputable suppliers.

**Parasite** *Cyclospora cayetanensis* (SI-klo-spor-uh KI-uh-te-NEN-sis)

**Illness** **Cyclosporiasis** (SI-klo-spor-I-uh-sis)

*Cyclospora cayetanensis* is a parasite that has been found in contaminated water and has been associated with produce irrigated or washed with contaminated water. It can also be found in the feces of infected people. Food handlers can transfer the parasite to food when they touch it with fingers containing feces. For this reason, food handlers with diarrhea must be excluded from the operation. It is also critical to purchase produce from approved, reputable suppliers.

**Food Commonly Linked with the Parasite**

- Incorrectly treated water
- Produce such as berries, lettuce, or basil

**Most Common Symptoms**

- Nausea
- Abdominal cramps
- Mild fever
- Diarrhea alternating with constipation
- Loss of weight
- Loss of appetite

**Prevention Measures**

- Purchase produce from approved, reputable suppliers.
- Keep food handlers with diarrhea out of the operation.
- Wash hands.



**Toxins**

**Toxin**    **Histamine** (*HISS-ta-meen*)

**Illness**    **Scombroid poisoning** (*SKOM-broyd*)

Histamine poisoning can occur when high levels of histamine in scombroid and other species of fish are eaten. When the fish are time-temperature abused, bacteria on the fish make the toxin. It cannot be destroyed by freezing, cooking, smoking, or curing.

**Food Commonly Linked with the Toxin**

- Tuna
- Bonito
- Mackerel
- Mahimahi

**Most Common Symptoms**

- Initially
- Reddening of the face and neck
  - Sweating
  - Headache
  - Burning or tingling sensation in the mouth or throat
- Possibly later
- Diarrhea
  - Vomiting

**Prevention Measures**

- Prevent time-temperature abuse during storage and prepping.
- Purchase from approved, reputable suppliers.

**Toxin**    **Ciguatoxin** (*SIG-wa-TOX-in*)

**Illness**    **Ciguatera fish poisoning** (*SIG-wa-TAIR-uh*)

Ciguatoxin is found in some marine algae. The toxin builds up in certain fish when they eat smaller fish that have eaten the toxic algae. Ciguatoxin cannot be detected by smell or taste. It is not eliminated by cooking or freezing the fish. Symptoms may last months or years depending on how severe the illness is.

**Food Commonly Linked with the Toxin**

Predatory tropical reef fish from the Pacific Ocean, the western part of the Indian Ocean, and the Caribbean Sea.

- Barracuda
- Grouper
- Jacks
- Snapper

**Most Common Symptoms**

- Reversal of hot and cold sensations
- Nausea
- Vomiting
- Tingling in fingers, lips, or toes
- Joint and muscle pain

**Prevention Measures**

- Purchase predatory tropical reef fish from approved, reputable suppliers.

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**Toxin** Saxitoxin (*SAX-ih-TOX-in*)

**Illness** Paralytic shellfish poisoning (PSP) (*PAIR-ah-LIT-ik*)

Some types of shellfish can become contaminated as they filter toxic algae from the water. People get sick with paralytic shellfish poisoning (PSP) when they eat these shellfish. Saxitoxin cannot be smelled or tasted. It is not destroyed by cooking or freezing. Death from paralysis may result if high levels of the toxin are eaten.

**Food Commonly Linked with the Toxin**

Shellfish found in colder waters, such as those of the Pacific and New England coasts.

- Clams
- Mussels
- Oysters
- Scallops

**Most Common Symptoms**

- Numbness
- Tingling of the mouth, face, arms, and legs
- Dizziness
- Nausea
- Vomiting
- Diarrhea

**Prevention Measures**

- Purchase shellfish from approved, reputable suppliers.

**Toxin** Brevetoxin (*BREV-ih-TOX-in*)

**Illness** Neurotoxic shellfish poisoning (NSP) (*NUR-o-TOX-ik*)

Some types of shellfish can become contaminated as they filter toxic algae from the water. People get sick with neurotoxic shellfish poisoning (NSP) when they eat these shellfish. Brevetoxin cannot be smelled or tasted. It is not destroyed by cooking or freezing.

**Food Commonly Linked with the Toxin**

Shellfish found in the warmer waters of the west coast of Florida, the Gulf of Mexico, and the Caribbean Sea.

- Clams
- Mussels
- Oysters

**Most Common Symptoms**

- Tingling and numbness of the lips, tongue, and throat
- Dizziness
- Reversal of hot and cold sensations
- Vomiting
- Diarrhea

**Prevention Measures**

- Purchase shellfish from approved, reputable suppliers.

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<b>Toxin</b>	<b>Domoic acid</b> ( <i>duh-MO-ik</i> )	
<b>Illness</b>	<b>Amnesic shellfish poisoning (ASP)</b> ( <i>am-NEE-zik</i> )	
<p>Some types of shellfish can become contaminated as they filter toxic algae from the water. People get sick with amnesic shellfish poisoning (ASP) when they eat these shellfish. The severity of symptoms depends on the amount of toxin eaten and the health of the person. Domoic acid cannot be smelled or tasted. It is not destroyed by cooking or freezing.</p>		
<b>Food Commonly Linked with the Toxin</b>	<b>Most Common Symptoms</b>	<b>Prevention Measures</b>
<p>Shellfish found in the coastal waters of the Pacific Northwest and the east coast of Canada.</p>	<p>Initially</p> <ul style="list-style-type: none"> <li>• Vomiting</li> <li>• Diarrhea</li> <li>• Abdominal pain</li> </ul> <p>Possibly later</p> <ul style="list-style-type: none"> <li>• Confusion</li> <li>• Memory loss</li> <li>• Disorientation</li> <li>• Seizure</li> <li>• Coma</li> </ul>	<ul style="list-style-type: none"> <li>• Purchase shellfish from approved, reputable suppliers.</li> </ul>
<ul style="list-style-type: none"> <li>• Clams</li> <li>• Mussels</li> <li>• Oysters</li> <li>• Scallops</li> </ul>		

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