

Food Protection

Lesson 7

Food-Borne Illness

There are three categories of food-borne illnesses—infection, intoxication and toxin-mediated infection.

FOOD-BORNE INFECTION

Food-borne illness is caused by eating food that contains large numbers of microorganisms which then enter the human digestive tract and disrupt the functions of the intestines, resulting in diarrhea and other problems. The severity of the problem depends on the amount ingested and the particular bacterium.

The first symptoms of infection occur from as early as six hours to as long as 48 hours after the contaminated food is eaten.

FOOD-BORNE INTOXICATION

Food-borne intoxication is caused by eating food that contains toxins generated by certain microorganisms. The longer a microorganism is on a food, the more time it has to multiply and produce its waste products. These waste products are toxins and result in intoxication when that food is eaten.

It is important to note that food-borne intoxication will cause nausea and vomiting, either immediately after the food is eaten or within the first six hours. Toxins are not destroyed by heat. Once they are formed, no amount of cooking will inactivate them.

FOOD-BORNE TOXIN-MEDIATED INFECTION

Food-borne toxin mediated infection occurs when food that has microorganisms on it is ingested. These micro-organisms find favorable growth conditions in the intestines and produce toxins that will then cause a food-borne illness.

COMMON FOOD-BORNE ILLNESSES

Salmonellosis

This illness occurs after eating food contaminated by the salmonella bacteria. Salmonella may be found naturally in a product such as raw chicken, or it can be introduced to a food product through poor food handling practice. This is one of the most frequently reported food-borne infections.



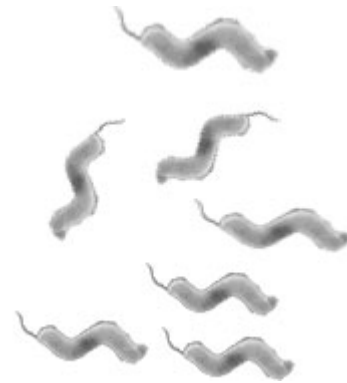
Organism responsible:	Salmonella enteritidis.
Source:	Animals, poultry, eggs and humans
Foods involved:	Chicken, poultry and eggs
Onset time:	Six to 48 hours.
Infection or Intoxication:	Infection.
Symptoms:	Abdominal pain, diarrhea, chills, fever, nausea, vomiting and malaise.

Control Measures:

1. Cook chicken, poultry and stuffing to a minimum of 165°F for at least 15 seconds. This will destroy the microorganism.
2. Refrigerate raw chicken, poultry, other meats and fish at 41°F or lower. This slows the growth of the microorganism and ensures that it does not multiply to dangerous levels.
3. Pay special attention to eggs; store **shell eggs** in a refrigerator that is 41°F or lower, always cook them to 145°F unless a customer requests otherwise, break and cook eggs to order. Use pasteurized eggs instead of raw eggs if a food is not going to be cooked to at least 145°F.
4. Avoid transferring the microorganism that is normally found on a raw food item to a food that is already cooked. This is called cross-contamination and can be prevented in the following ways:
 - Wash your hands thoroughly after handling raw products and before handling cooked products.
 - Ensure that there is no direct hand contact with a food that is ready to be eaten. Use gloves, tongs, deli paper and other utensils when handling foods that are ready to be eaten.
 - Wash, rinse and sanitize cutting boards, dishes and utensils after using with raw products and before using with cooked products.
 - In refrigerated storage, place cooked foods on the upper shelves and raw products on the lower shelves.

Campylobacteriosis

This is a food-borne infection of bacterial origin that occurs when eating contaminated food. These bacteria are found in the intestines of sheep, pigs, cattle and poultry, and are spread during the slaughter and processing of these animals. This illness is now more commonly reported than Salmonellosis



Organism Responsible

Campylobacter jejuni.

Source

Intestine of sheep, pigs, cattle and poultry

Foods Involved

Raw milk, poultry, beef, liver and water

Onset

2 to 10 days

Intoxication or Infection

Infection

Symptoms

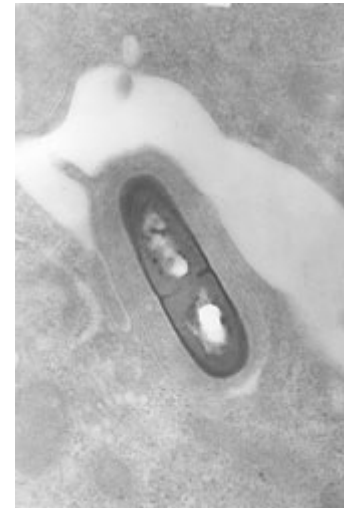
Diarrhea (often bloody), severe abdominal pain, fever, loss of appetite, malaise, headache and vomiting

Control Measures

- Properly sanitize equipment to prevent cross-contamination
- Thoroughly cook meat, poultry, and seafood
- Use only pasteurized milk
- Use potable water

Listeriosis

These bacteria are excreted in the feces of infected food animals and poultry. Raw vegetables grown on contaminated soil, dairy products and raw meats from contaminated animals are responsible for its spread. This is particularly serious for pregnant women as it can cause miscarriages and stillbirths. It may also cause mental retardation and death of newborn infants.



Organism Responsible

Listeria monocytogenes

Source

Soil, infected animals or humans and water

Foods Involved

Unpasteurized milk, raw vegetables, poultry, raw meats and cheese

Onset

1 day to 3 weeks

Intoxication or Infection

Infection

Symptoms

Low-grade fever, flu-like illness, stillbirths, meningitis and encephalitis (can be fatal)

Control Measures

- Cook foods thoroughly to the required temperatures.
- Use pasteurized milk and dairy products.
- Thoroughly wash raw vegetables before eating.
- Keep facilities clean and dry.

Shigellosis	This bacterial illness is sometimes called <i>bacillary dysentery</i> . This infection occurs when food workers who are carriers of the bacteria fail to wash their hands after using the toilet. Flies also are responsible as they can transmit the bacteria from feces to food.
Organism Responsible	Shigella species
Source	Humans
Foods Involved	Raw produce, green salads, and foods such as tuna, turkey, macaroni and potato salad
Onset	1 to 7 days
Infection or Intoxication	Infection
Symptoms	Abdominal pain, diarrhea, bloody stools and fever
Control Measures	

- Employ proper hand washing, especially after using toilet
- Rapidly cool foods to 41°F or below
- Cook all foods to proper temperatures
- Eliminate flies from your establishment

Staphylococcal Food Intoxication This is one of the most common food-borne intoxications. It occurs through the poor personal hygiene practices of food workers. Failure to wash hands after coughing and sneezing, and having infected cuts, bruises, boils and wounds are all responsible for the spread of this illness.



Organism Responsible Staphylococcus aureus

Source Healthy human beings: in our nose and throat, on our hair, on infected cuts, bruises, abscesses and acne

Foods Involved Baked goods, custards and pastry, cooked foods that are traditionally left out at room temperature
Ham, sliced meats and other foods with low water activity

Onset One to six hours

Infection or intoxication: Intoxication

Symptoms Nausea, vomiting, retching, abdominal pain, diarrhea and prostration

Control Measures

- Prevent direct hand contact with ready-to-eat foods by using gloves, tongs, deli paper or other utensils
- Prevent ill food workers from working in a food establishment to reduce the opportunity to contaminate cooked foods
- Use refrigeration whenever possible to prevent multiplication, growth and the production of toxins
- Wash, rinse and sanitize any equipment that is contaminated

Botulism

This food-borne intoxication can result in death. The responsible organism prefers an anaerobic environment (one with no air). **Home-canned products are especially prone to contain botulism;** commercially canned products are treated to a temperature and pressure that cannot be duplicated at home. Vacuum packaged products and garlic in oil can be hazardous as these provide an anaerobic environment.



Organism Responsible

Clostridium botulinum

Source

Soil, water, intestinal tract of animals and fish

Foods Involved

Home-canned foods, smoked and vacuum packaged fish, garlic products in oil and baked potatoes

Onset Time

12 to 36 hours

Infection or Intoxication

Intoxication

Symptoms

Gastrointestinal symptoms may precede neurological symptoms such as vertigo; blurred or double vision; dryness of mouth; difficulty swallowing, speaking and breathing; muscular weakness and respiratory paralysis; can lead to death

Control Measures:

- Never use home-canned/jarred products
- Store vacuum packaged/sous vide products at manufacturer's recommended temperatures
- Do not allow cooked foods to remain in the Temperature Danger Zone
- Use commercially prepared garlic-in-oil products
- Store smoked fish at 38°F or less

Scombroid Poisoning

This is an intoxication caused by histamine poisoning. Certain finfish such as tuna, bluefish, mackerel, bonito and mahi-mahi, if not refrigerated immediately after being caught, begin to decompose, producing histamine. This histamine, which is odorless, tasteless and not destroyed in the cooking process, causes scombroid poisoning.



Source

Decomposition of fish

Foods Involved

Tuna, bluefish, mackerel, bonito and mahi-mahi

Onset Time

Minutes to two hours

Infection or Intoxication

Intoxication

Symptoms

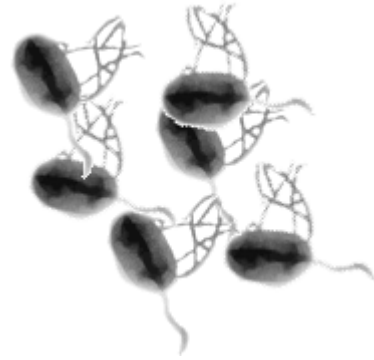
Headache, dizziness, nausea, vomiting, peppery taste, burning throat, facial swelling and stomach pain

Control Measures

- Use a reputable supplier
- Refuse fish that have been thawed and re-frozen. Signs that fish have been re-frozen include dried or dehydrated appearance; excessive frost or ice in the package; or white blotches (freezer burn)
- Check temperature—fresh fish must be between 32°F and 41°F
- Thaw frozen fish at refrigeration temperature of 41°F or below

Escherichia coli

This is a severe illness that is responsible for renal failure and death among children. The bacteria is found in the intestinal tract of humans and animals, particularly **cattle**. During slaughter the intestinal contents may come in contact with the carcass. If the meat from this carcass is not cooked properly, the bacteria will survive and cause problems. This is an even greater concern when dealing with **ground meat**, because the grinding process distributes the bacteria throughout the product. Cattle feces may also contaminate milk and water.



Organism Responsible

Escherichia coli 0157:H7

Source

Humans, cattle and sewage-contaminated water

Foods Involved

Raw foods, raw or under cooked beef, unpasteurized milk and untreated water

Onset

12-72 hours

Infection or Intoxication:

Both

Symptoms:

Severe abdominal pain, diarrhea (sometimes bloody), nausea, vomiting, chills; in children, can lead to HUS (Hemolytic Uremic Syndrome), which is now considered to be the leading cause of kidney failure in children as well as affecting their pancreas and the brain

Blood transfusion may become necessary as blood poisoning occurs

Control Measures

- Cook ground beef to 158°F. This will destroy the microorganism
- Cook all foods to required minimum cooking temperatures
- Use pasteurized milk
- Reheat all foods to 165°F within 2 hours
- Avoid cross-contamination
- Wash hands thoroughly after touching raw foods or after any activity that may have contaminated hands

Clostridium Perfringens Enteritis This is both an infection and intoxication. These bacteria can produce toxins on food (intoxication). If viable cells are present on the food in large quantities, they can cause gastroenteritis (infection) once consumed. This illness usually clears up by itself within 24 hours.



Organism Responsible Clostridium perfringens

Source Soil, dust and gastrointestinal tract of healthy humans and animals (cattle, pigs, poultry and fish)

Foods Involved Cooked meats, poultry, gravy and beans

Onset 8 to 22 hours

Infection or Intoxication Both

Symptoms Abdominal pain and diarrhea

Control Measures

- Rapidly cool meat dishes
- Rapidly reheat foods to 165°F within 2 hours
- Do not reheat foods on steam table or any other hot holding equipment
- Avoid preparing foods days in advance
- Hold hot cooked foods at 140°F or above

Bacillus Cereus Gastroenteritis

This is an intoxication in which two different toxins are formed, each with differing times of onset and symptoms. The organisms responsible for this illness are found in the soil; therefore, they can be present in virtually all those products that are grown in soil such as rice, wheat, potatoes etc.

Organism Responsible

Bacillus cereus

Source

Soil

Foods Involved

Grains, rice, flour, spices, starch, dry-mix products, meats and milk

Onset

30 minutes to five hours

Infection or Intoxication:

Both

Symptoms

Nausea, abdominal pain and watery diarrhea

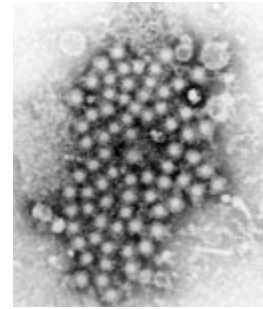
Control Measures

- Do not keep foods at room temperature
- Rapidly reheat foods to 165°F within 2 hours
- Rapidly cool foods to 41°F
- Serve cooked foods quickly after preparation

VIRUSES

Viral Hepatitis

This is a viral disease that affects the liver. The first signs appear 15 to 50 days after one becomes infected. The foods most often implicated are raw shellfish (oysters and clams), fresh salads and other lightly cooked foods. Because of the long incubation period of this illness and its association with shellfish, **tags** must be kept for 90 days to aid a trace back to their source.



Organism Responsible Hepatitis A

Source Fecal-contaminated waters

Foods Involved Raw or lightly cooked shellfish, salads and cold cuts

Onset 15 to 50 days

Symptoms Fever, malaise, listlessness, nausea, abdominal pain and jaundice

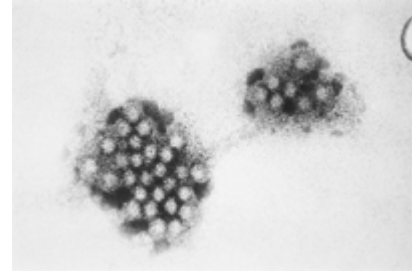
Control Measures

- Food workers must practice good personal hygiene by washing their hands thoroughly
- Obtain shellfish from reputable, certified shellfish supplier
- Use potable water

Noroviruses

(Norwalk Virus Gastroenteritis)

This illness is caused by the poor personal hygiene habits of food workers. The virus is found in the feces of infected food workers and is passed on through casual contact. Contaminated water and foods eaten raw or lightly cooked are the ones likely to be implicated.



Organism Responsible

Norwalk-like virus

Source

Feces of infected humans

Foods Involved

Raw vegetables, coleslaw, raw shellfish and eggs

Onset

24 to 48 hours

Symptoms

Nausea, vomiting, abdominal pain, low-grade fever, chills and headache

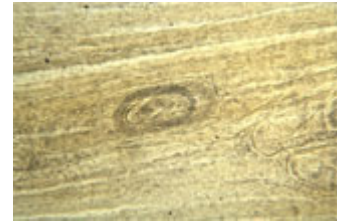
Control Measures

- Cook shellfish thoroughly
- Practice good personal hygiene
- Use a potable water supply
- Avoid cross-contamination

PARASITES

Trichinosis

The parasite that causes this illness is found in the flesh of pork. When under-cooked pork is eaten, humans become a host to the trichinae worm, where it causes the illness known as trichinosis.



Organism Responsible

Trichinella spiralis

Source

Pork, bear and walrus

Foods Involved

Raw and inadequately cooked pork, bear and walrus flesh that is contaminated with trichinosis

Onset

4 to 28 days

Symptoms

Gastroenteritis, fever, swelling of the eyes, muscular pain, chills, prostration and labored breathing

Control Measures

- Cook pork and foods containing pork to 155°F for 15 seconds
- Wash, rinse and sanitize equipment used to process pork and pork products