



Your Experts for Life

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The Food Spoilers: Bacteria and Viruses

Foodborne illness (food poisoning) is costly, both in dollars and in lives. The economic cost in the United States alone has topped \$8 billion a year. Of course, the cost in lives is far greater. Although most people who get food poisoning do not die, some do—over 9,000 annually in the United States. And foodborne illnesses are even more commonplace in underdeveloped countries.

A foodborne illness may be caused by a variety of things associated with foods. Bacteria, viruses, parasites, natural plant toxins, and commercial chemicals can all cause foodborne illnesses. This publication deals with foodborne illnesses caused by the microorganisms we think of as germs—bacteria and viruses.

If you contract a foodborne illness you may think you have the flu or a virus that is going around. This is natural because the symptoms of food poisoning are similar to those of other illnesses. These symptoms often include diarrhea, vomiting, abdominal cramps, fever, chills, and headache.

In contagious diseases, you contract the disease from another human. With foodborne illnesses, the germs are on food or in water. Humans or animals may transfer the germs to the food or water, but you actually contract the illness from what you eat or drink.

Bacteria and viruses are located almost everywhere—in the soil, water, and air. Therefore, it is very difficult to rid a food product of all germs. The necessary conditions for germs to grow include:

- Nourishment—foods are an excellent source.
- Correct temperature—between 40 and 140 degrees Fahrenheit. When foods are not in the refrigerator or being cooked, they will usually be in this range.
- Time to grow.

As the following table shows, very little time is needed for germs to grow. It takes only about 20 minutes for them to double their number if the

conditions are right. A single bacterium can reproduce to over 60 in 2 hours, to over 500 in 3 hours, to over 2 million in 7 hours. When you consider that many bacteria may be present in the beginning, you can see how important it is to take precautions, including good personal hygiene and proper food handling.

This publication can help you avoid foodborne illnesses by providing you with:

- Descriptions of the major microorganisms as they relate to foodborne illnesses.
- Habitat—where the germs are found.
- Foods involved—water and foods that are a good place for the germs to live.

Bacterial Growth Rate

Time	Bacteria
8:00	1
8:20	2
8:40	4
9:00	8
9:20	16
9:40	32
10:00	64
10:20	128
10:40	256
11:00	512
11:20	1,024
11:40	2,048
12:00	4,096
12:20	8,192
12:40	16,384
1:00	32,768
1:20	65,536
1:40	131,072
2:00	262,144
2:20	524,288
2:40	1,048,576
3:00	2,097,152

- Method of transmission—how you can get the illness.
- Symptoms—signs of sickness.
- Onset—how long it takes for you to get sick.
- Duration—how long the illness may last.
- Prevention—what you can do to keep from getting sick.

The number of germs required to cause illness varies between types of germs and between indi-

viduals. Those people most vulnerable to foodborne illnesses include the elderly, infants, and people who are already sick. The people in these groups have one thing in common: their immune systems are not as capable of fighting off germs.

For more detailed information about a certain foodborne illness, contact your county Extension agent or local health department.

Bacteria In Foods

BACTERIA	<i>Bacillus cereus</i>	<i>Campylobacter jejuni</i>	<i>Clostridium botulinum</i>
DESCRIPTION	Grows well in a normal atmosphere and survives normal cooking	Widespread in nature; cause of meningitis and urinary infections	Causes botulism; produces a deadly toxin under a vacuum; very rare
HABITAT	Soil, dust, and spices	Intestinal tracts of human and animals	Soil, plants, fish
FOODS INVOLVED	Grain products, rice, starchy foods, puddings	Unpasteurized milk, undercooked poultry, raw meat, untreated water	Home-canned foods
METHOD OF TRANSMISSION	Eating contaminated foods not properly cooked	Drinking contaminated water, eating contaminated food, infected handlers, rodents, insects	Improper methods of home canning
SYMPTOMS	Nausea, abdominal cramps, diarrhea, vomiting	Nausea, cramps, headache, fever, diarrhea	Blurred vision, respiratory distress, and possible death
ONSET	2-16 hours	12-36 hours	12-48 hours
DURATION	1 day	2-7 days	Varies widely
PREVENTION	Keep cooked food hot (above 140°F) or consume quickly.	Cook properly and reheat to 165°F.	Toxin is destroyed by boiling for 10 minutes.
BACTERIA	<i>Clostridium perfringens</i>	<i>Escherichia coli</i>	<i>Escherichia coli</i> 0157:H7
DESCRIPTION	Very common; called the “buffet germ;” grows rapidly in large portions of food, such as beef roast	Occurs worldwide; known as “tourist diarrhea” or “traveler’s dysentery”	
HABITAT	Dust, soil, intestinal tracts of humans and animals.	Intestinal tracts of humans and animals	Intestinal tracts of humans and some mammals
FOODS INVOLVED	Meat and poultry dishes, sauces and gravies	Primarily animal products and water	Water, raw milk, raw or rare ground beef, unpasteurized fruit juices, unwashed fruits and vegetables
METHOD OF TRANSMISSION	Improper temperature control, handler contamination	Foods and water contaminated by handlers and flies	Foods contaminated by animal feces
SYMPTOMS	Diarrhea, cramps, nausea (no vomiting)	Diarrhea, chills, headache, cramps, fever	Diarrhea or bloody diarrhea, abdominal cramps, nausea, malaise
ONSET	8-15 hours	1-3 days	2 days - 2 weeks
DURATION	12-24 hours	2-9 days	Usually 8 days but can last months
PREVENTION	Heat foods quickly, then cool rapidly.	Avoid contaminated foods. Cook foods thoroughly. Use proper personal hygiene.	Cook meat to proper internal temperature. Wash and peel fresh fruits and vegetables. Purchase pasteurized fruit and vegetable juices.

BACTERIA	<i>Listeria monocytogenes</i>	<i>Salmonella (species)</i>	<i>Yersinia enterocoliticus</i>
DESCRIPTION	Cause of Listeriosis; widespread in air, soil, water; attacks those with weak immune systems	Cause of salmonellosis; over 2,000 species; very common	Also known as Pasteurella or Yersiniosis
HABITAT	Intestinal tracts of humans and animals	Intestinal tracts of humans and animals	Untreated water: streams, ponds
FOODS INVOLVED	Soft cheeses, contaminated milk, raw milk, undercooked meats, vegetables	Poultry, eggs, red meats, dairy products	Pork, meats, raw milk, leftovers
METHOD OF TRANSMISSION	Contaminated foods	Contaminated foods, contact with infected person or rodent	Contaminated water or foods
SYMPTOMS	Headache, nausea, fever, vomiting	Headache, vomiting, diarrhea, cramps, and fever	Cramps, fever, headache, diarrhea, vomiting
ONSET	1-12 days	12-36 hours	24-36 hours
DURATION	2-7 days	2-7 days	3 days
PREVENTION	Cook foods thoroughly. Use pasteurized milk. Chill foods rapidly.	Cook foods thoroughly and re-heat to at least 165°F.	Properly cook and handle foods
BACTERIA	<i>Shigella dysenteriae</i>	<i>Staphylococcus aureus</i>	<i>Streptococcus pyrogenes</i>
DESCRIPTION	Cause of shigellosis or bacillary dysentery; occurs mainly in fall and winter	Cause of “staph;” increased occurrence during the summer	Cause of streptococcal infections (scarlet fever and “strep throat”)
HABITAT	Intestinal tracts of humans	Nose, throat, and open wounds	Respiratory tract and nasal passageway
FOODS INVOLVED	Most foods and water	Meat and seafood salads, sandwich spreads	Milk, ice cream, eggs, potato salad, puddings
METHOD OF TRANSMISSION	Spread of fecal contamination to food handlers and foods	Spread by infected food handlers	Spread to food by coughing or sneezing
SYMPTOMS	Fever, loss of appetite, vomiting, cramps, massive diarrhea	Nausea, vomiting, diarrhea	Sore throat, tonsillitis, fever, headache, nausea, vomiting, occasional rash
ONSET	1-7 days	30 minutes to 8 hours	1-3 days
DURATION	About one week	1-2 days	Several weeks
PREVENTION	Good personal hygiene. Cook foods thoroughly. Chill rapidly.	Chill foods rapidly. Avoid holding foods between 40° and 140°F. Good personal hygiene.	Cook foods rapidly. Chill rapidly.
BACTERIA	<i>Vibrio parahaemolyticus</i>	<i>Vibrio cholera</i>	<i>Vibrio vulnificus</i>
DESCRIPTION	Needs salt to grow. Found in seawater.	Found in seawater.	Occurs naturally rather than as a result of pollution.
HABITAT	Aquatic waters and shellfish	Fish and shellfish, crustaceans	Warm coastal waters
FOODS INVOLVED	Raw fish and shellfish	Raw seafood: oysters, shrimp, crabs, and clams	Raw shellfish
METHOD OF TRANSMISSION	Improperly cooked and recontaminated foods	Improper cooking	Improper cooking, eating raw seafood
SYMPTOMS	Diarrhea, cramps, vomiting, headache, fever	Diarrhea, weakness, chills, nausea	Headache, cramps, diarrhea
ONSET	12-48 hours	3-76 hours	12-24 hours
DURATION	2-5 days	1-8 days	3-6 days
PREVENTION	Properly cook and handle seafood.	Properly cook and handle seafood.	Properly cook and handle shellfish.

Viruses In Foods

VIRUSES	<i>Hepatitis A</i>	<i>Norwalk</i>	<i>Poliomyelitis</i>
DESCRIPTION	Causes about 500,000 illnesses a year; seasonal	Difficult to avoid in undercooked foods and contaminated water	Very rare; cause of foodborne polio
HABITAT	Only in humans	Contaminated water, sewage	Contaminated water
FOODS INVOLVED	Milk, raw shellfish, potato salad	Seafood, ice, water	Milk and other beverages
METHOD OF TRANSMISSION	Foods contaminated by infected workers, contaminated water	Contaminated water	Contaminated water
SYMPTOMS	Fever, nausea, abdominal cramps	Diarrhea, nausea, vomiting, cramps	Fever, vomiting, headache, paralysis
ONSET	10-50 days	1-2 days	5-35 days
DURATION	Several months	2-3 days	Weeks to months
PREVENTION	Properly cook foods. Use good personal hygiene.	Properly cook foods, boil water. Use good personal hygiene.	Properly cook foods. Use good personal hygiene.

How to Fight the Food Spoilers

- When shopping for food, pick up perishable foods, meat, poultry, and dairy items last; get them home and into the refrigerator or freezer quickly.
- Never buy food in damaged containers such as leaking, bulging, or severely dented cans, cracked jars, or jars with loose or bulging lids.
- Maintain a refrigerator temperature of 40 degrees F (2 to 4 degrees C) or below, and a freezer temperature of 32 degrees F (0 degrees C) or lower. Check each frequently.
- Thaw meat and poultry in the refrigerator or, for faster results, in a watertight package under cold running water.
- Wash hands thoroughly with soap and warm water before handling foods.
- After handling raw foods such as meat, poultry, vegetables, or fruits, wash your hands before touching other foods or food surfaces.
- Wash utensils, containers, and work surfaces before and after they come into contact with raw foods, especially meat or poultry.
- Always keep hot foods hot (above 140 degrees F) and cold foods cold (below 40 degrees F).
- Refrigerate leftovers promptly in properly covered containers.

If You Think Someone Has a Foodborne Illness:

1. **Preserve the evidence.** Wrap remaining food securely, mark "DANGER," and freeze it. Save all the packaging material. Write down all available information about the food and symptoms. Save any identical unopened products.
2. **Seek treatment as necessary.** If the victim is in an at-risk group or if symptoms persist or are severe (bloody diarrhea, excessive nausea and vomiting, high temperature), call your doctor.
3. **Call the local health department** if the suspect food was served at a large gathering, from a restaurant, or if it is a commercial product.
4. **Call the USDA Meat and Poultry Hotline** (1-800-535-4555) if the suspect food is a USDA-inspected product and you have all the packaging.



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For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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