

## Objectives

After reading this chapter, you will be able to

- explain how food becomes contaminated with pathogens.
- describe common types of foodborne illness.
- list the symptoms of foodborne illness
- prevent foodborne illness.

## New Terms

**foodborne illness:** disease caused by a pathogen in food.

**pathogen:** an organism or substance that invades the body and damages its cells.

**bacteria:** tiny organisms that are found everywhere. A few types can cause foodborne illness.

**danger zone:** temperatures at which bacteria grow fastest (40°F to 140°F or 5°C to 60°C).

**toxin:** poison.

**cross-contamination:** spreading bacteria to a clean food from contaminated work surfaces, utensils, hands, or food.

**sanitation:** the study and use of methods that create a clean, healthy environment.

A community egg hunt was planned. Three days before the event, Ivan and his friends began hard-cooking and dyeing 3,000 eggs, 9-1. Soon the refrigerator was full, so Ivan started stacking the cooked eggs in boxes on the counter. A few hours after the hunt, many children who had eaten some eggs started vomiting. Some had diarrhea. What happened?

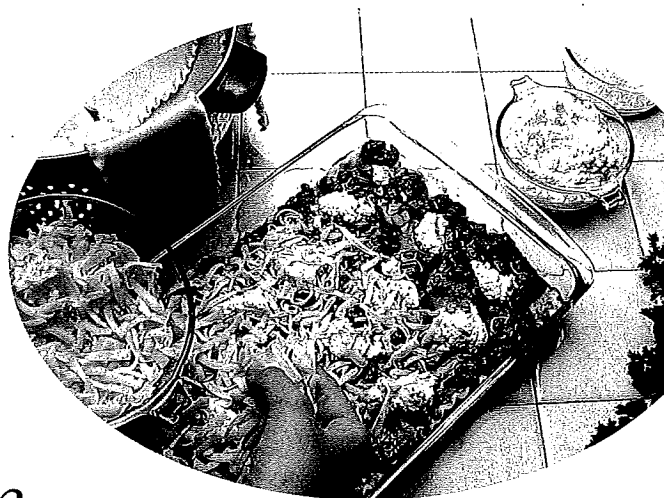
Maria sliced some raw chicken into strips and put them in a bowl. "Jason," she called, "please come and help me make a tossed salad." Maria handed the cutting board she had used for the chicken to Jason. "Here, slice the salad ingredients on this." Later, Maria's family thought they had the flu. What happened?

The food for the party was ready, 9-2. "Wow! I'm way ahead of schedule," said Sonja. "My friends won't arrive for at least four hours. I'll take the lasagna out of the oven and cover it with foil. That should keep it hot. I'll pop it in the oven for a few minutes just before everyone arrives." Early the next morning, many of Sonja's friends felt ill. What happened?

What did happen to the children from the egg hunt, Maria's family, and Sonja's friends? The food they ate made them sick! They were victims of foodborne illness.



*9-1 What mistake did Ivan make after cooking the eggs for the community egg hunt?*



*9-2 What should Sonja have done to have kept the lasagna safe to eat?*

## What Causes Foodborne Illness?

**Foodborne illness** is caused by foods that are not stored or prepared in a clean or safe manner. Foods prepared in a dirty kitchen can cause foodborne illness, too. Most foodborne illnesses just make you sick. Some can kill you. Foodborne illness is also called *food poisoning*.

Foodborne illness is very common. Health experts believe it affects more than one out of every 20 people in the United States each year. In fact, they think half of all diarrhea cases are caused by foodborne illness.

Many people who get foodborne illness don't even know it. They think they have the stomach flu. That's because the symptoms of many foodborne illnesses are the same as flu symptoms. Both often cause cramps, headache, diarrhea, vomiting, fever, and weakness. The next time you think you have the flu, you may really have a foodborne illness.

Foodborne illness can start any time, any place, in any food. It occurs when you eat a food that contains a pathogen. A **pathogen** (PATH-uh jen) is an organism or substance that invades the body and damages its cells. Harmful bacteria, viruses, parasites, molds, and poisons are pathogens.

## Bacteria

**Bacteria** are tiny animals. They have only one cell and are found everywhere! They are found in food, on your hands, and on tabletops. They are in the air you breathe and water you drink. Each day, you are exposed to billions of bacteria! See 9-3.

Bacteria are the most common cause of foodborne illness. Many bacteria are helpful. For instance, helpful bacteria are used to make yogurt and cheese. Some help fight disease. Others can make certain

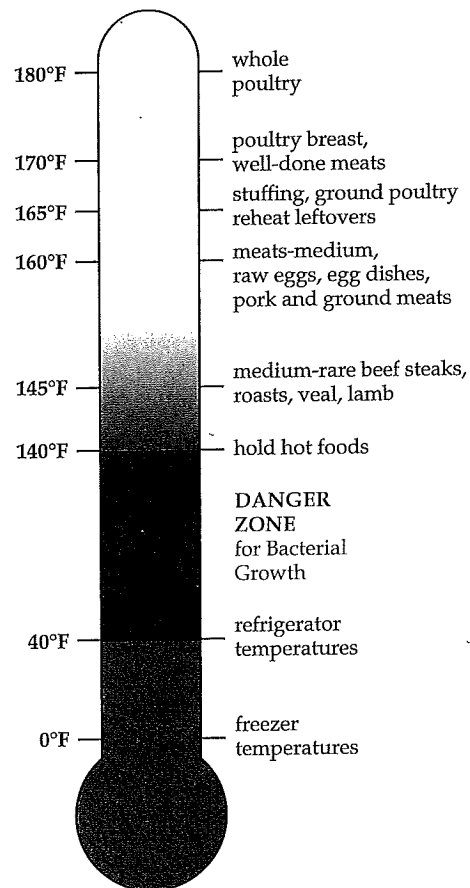


*9-3 Thousands of tiny bacteria can fit on the tip of a pin.*

vitamins. Luckily, only a few types of bacteria pose a threat.

Almost all foods contain small amounts of harmful bacteria. Small amounts won't make you sick, but large numbers will. Bacteria increase in number quickly when they get a chance. All they need are nutrients, moisture, and warmth. Foods, especially protein-rich foods, are an ideal place for bacteria to grow. Protein-rich foods include meats, fish, poultry, eggs, and milk products.

Bacteria like warm temperatures. They grow fastest at temperatures of 40°F to 140°F (5°C to 60°C). This temperature range is called the **danger zone**, 9-4.



*9-4 Bacteria grow best in the danger zone.*

## NEW TECHNOLOGY

# Electronic Pasteurization

Pathogens in foods are a major health problem in the United States. To help fight pathogens, more and more food processors are using a powerful weapon called *electronic pasteurization*. This process uses electricity to make waves of energy that are like microwaves. These energy waves kill harmful bacteria on meat, poultry, eggs, seafood, and spices. The energy waves also kill insects and mold that may be on fresh fruits and vegetables. Electronic pasteurization keeps onions, garlic, and potatoes from sprouting, too. Unlike microwaves, the energy waves from this process do not cook foods.

Fresh and processed foods that are electronically pasteurized stay fresh and safe to eat much longer than other similar foods. However, even foods that have been treated with this process need to be stored safely. Keep in mind, milk is pasteurized, but it still must be kept refrigerated. In the same way, treated meat, poultry, eggs, and seafood still need to be kept refrigerated or frozen. The next time you shop for food, look for electronically pasteurized foods. These foods can help you avoid foodborne illness.

Bacteria grow by dividing. In just two hours, foods left in the danger zone can contain thousands of bacteria. The danger zone includes room temperature and low cooking temperatures. Most bacteria die at higher temperatures.

That means cooking helps make your food safe, 9-5. Bacteria grow very slowly at lower temperatures. You can protect yourself by storing foods in a cold refrigerator or freezer.

Bacteria can cause two types of foodborne illness. They can cause either an infection or poisoning. Bacteria that cause infections are *Campylobacter*, *Salmonella*, and *Listeria*. Bacteria that produce a **toxin** (poison) as they grow cause poisoning. *Staphylococci*, *Clostridium perfringens*, *Clostridium botulinum*, and *E. coli* are bacteria that produce toxins.



*9-5 One way to prevent foodborne illness is to serve foods piping hot.*

### Campylobacter

*Campylobacter* (KAM pee-loh-BAK-ter) bacteria are the most common cause of foodborne illness. Food scientists call these

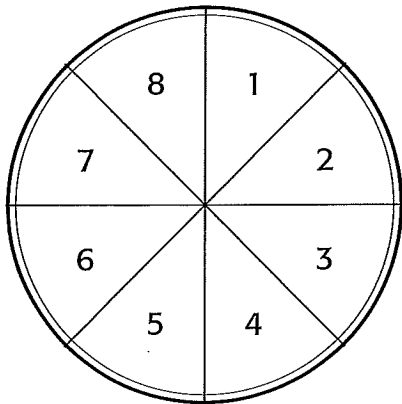
## SCIENCE IN THE KITCHEN

## Growing Bacterial Colonies

Bacteria reproduce by dividing. When they have nutrients, moisture, and warmth, they reproduce quickly. In fact, they can double in number every 20 minutes. That means in 20 minutes, 100 bacterial cells become 200. After 20 more minutes, these 200 become 400 bacterial cells. In a little more than three hours, there could be over a million bacteria!

One bacterial cell is so small you cannot see it, but you can see colonies of bacteria. This experiment will let you observe how bacteria grow. You will need cellophane tape, a packet of plain gelatin, sugar, a heavy-duty paper plate, and plastic wrap.

To begin, draw lines on the paper plate to divide it into eight sections (see drawing). Number each section. Now, bring  $\frac{1}{4}$  cup of water to a boil. Add 2 teaspoons



of sugar, and 1 packet of gelatin and stir until the gelatin dissolves. Remove the pan from the heat and cool for 2 minutes. Pour the mixture onto the paper plate and chill until firm.

Now, transfer bacteria to the gelatin from these seven items: sink drain, cutting board, tabletop, floor, unwashed hand, washed hand, and your hair. Use the following process to transfer bacteria. First, tear off a 2-inch strip of tape. Next, put the sticky side of the tape on the first item. Pull off the tape and then lay it, sticky side down, on the gelatin in the section marked with the number 1. Now, gently lift off the tape. Tear off a clean piece of tape and repeat this process for the other items. Don't transfer bacteria to the section marked with the number 8.

Cover the plate with plastic wrap. Place the covered plate in a warm (not hot) location for three days. Without removing the plastic wrap, describe what you see in each of the sections. Were any sections free of bacterial colonies? Which ones? Which sections had the largest colonies? Why do you think this occurred? How can you use your observations to keep food safe to eat? Dispose of the covered paper plate.

To determine the effect of refrigeration upon bacterial growth, you could prepare two plates as described above and store one of the plates in the refrigerator. Then compare the differences.

bacteria "Campy." Cooking food can kill these bacteria. Raw or partly cooked poultry is the main source of the foodborne illness caused by these bacteria. Campy also can spread from one food to others. For instance, suppose you sliced raw chicken contaminated with Campy. Then, you sliced lettuce that was not contaminated. After slicing the chicken, the cutting board, knife, and your hands were contaminated with bacteria. You can spread bacteria to the lettuce just by touching it with an unwashed hand, cutting board, or knife. Spreading bacteria to a clean food from contaminated work surfaces, utensils, hands, or food is called **cross-contamination**.

### Salmonella

There are over 2,000 types of *Salmonella* (*sal-muh-NEHL-ah*) bacteria. Cooking can kill all types. However, *Salmonella* is one of the most common causes of foodborne illnesses. Raw poultry and eggs are the main food sources of *Salmonella* bacteria. *Salmonella* can enter food through cross-contamination, too.

### Listeria

*Listeria* (*lih-STEER-ee-ah*) bacteria are found mostly in raw milk. All milk sold in the United States must be heated before it is sold. The heat kills these bacteria. A few soft cheeses are made with milk that is not heated. Examples of these cheeses are Brie and Camembert. These cheeses, hot dogs, and lunch meats are the main source of foodborne illness caused by *Listeria*. Unwashed fruits and vegetables may be a source of *Listeria*, too, 9-6. These foods become infected with *Listeria* when polluted water is used to water crops.



**9-6** *Thoroughly wash fruits and vegetables to reduce the risk of foodborne illness.*

### Staphylococci

*Staphylococci* (*staff-low-COCK-eye*), or Staph, are the most common type of bacteria that produce a toxin in foods. Protein-rich foods and cream filled pastries are the most frequent sources of these bacteria. Moist salads made with chopped foods (such as potato salad, macaroni salad, and ham salad) are common sources, too. These bacteria live in your nose, throat, and skin sores and enter food when you sneeze or cough. They also enter if your hands are dirty or have an open sore.

Neither the Staph bacteria nor their toxin are destroyed by heat. The only way to avoid this type of foodborne illness is to prevent the growth of the bacteria. Keeping

foods out of danger zone temperatures stops the growth of Staph. It also prevents these bacteria from producing the toxin.

### *Clostridium perfringens*

*Clostridium perfringens* (clahs-TRIH-dee-um per-FRIHN jens) bacteria are sometimes called "banquet germs." That's because most outbreaks occur at restaurants or events such as picnics and banquets. Foods served at picnics, banquets, cafeterias, and restaurants often are made ahead of time. Many times, foods are kept warm, but not hot. If foods are kept at danger zone temperatures, these bacteria grow fast and make their toxin. Gravy, protein-rich foods, stews, soups, and creamy foods are the most common sources of these illness-causing bacteria. See 9-7.

*Clostridium perfringens* bacteria are found in soil, water, milk, dust, and sewage. They enter food through polluted water and

may be on unwashed fruits and vegetables. These bacteria also enter the food supply through dust that settles on food. They can enter food through cross-contamination, too.

### *Clostridium Botulinum*

The toxin made by the *Clostridium botulinum* (botch you-lye-nuhm) bacterium causes the disease called *botulism* (BOTCH you-lih-zum). These bacteria cause a deadly type of foodborne illness. Scientists believe the botulism toxin is the strongest poison known. An amount as small as a grain of salt can kill many people in less than an hour.

The bacteria that cause botulism live in soil and water. They can grow only if no air is present. This is why they thrive in foods sealed in airtight jars and cans. During the canning process, foods are sealed in cans or jars and heated. The heat kills these bacteria. If the food inside the can or jar isn't heated to a high enough temperature for a long enough time, these bacteria don't die. This rarely happens in canned foods sold in supermarkets. It happens mostly in foods canned at home. If you plan to can food, be certain to use safe techniques. The Cooperative Extension program in your state can teach you these techniques.

To avoid this foodborne illness, check food cans and jars closely. If a can or jar is leaking, rusting, bulging, or has holes, the food inside may contain the botulism toxin. If you suspect a food contains the botulism toxin, don't take any chances. Discard the food so no person or animal can eat it. Tasting one bean contaminated with botulism toxin can kill you.

### *E. coli*

Most types of *E. coli* (EE coal-EYE) bacteria are harmless, but at least six types can cause serious illness. One of the most



*9-7 Clostridium perfringens growth is prevented by keeping buffet food steaming hot.*

dangerous types is *E. coli* 0157.H7. Undercooked meat, especially hamburger, is often blamed for outbreaks of the foodborne illness caused by these bacteria. The illness can cause death, especially in children and the elderly.

To safeguard against these harmful bacteria, thoroughly cook all raw meats. If eating in a restaurant, always order meat cooked well done. Never eat undercooked meats. Before you eat meat, first cut into it. If it is red or pink, do not eat it.

## Viruses

The most common foodborne illness caused by a virus is *hepatitis* (*heh pah-TYE-tuhs*). This virus is found in water contaminated with sewage. Raw fish, oysters, and clams caught in polluted water are common causes of hepatitis. This virus may be on skins of unwashed fresh fruits and vegetables, too. Cross-contamination is also a cause of hepatitis.

Hepatitis is a very serious disease. It can be deadly. It causes nausea, vomiting, weakness, and liver damage. Heat destroys the hepatitis virus. You can avoid this virus by cooking seafood thoroughly. Washing all fresh fruits and vegetables well also helps prevent hepatitis.

## Parasites

A *parasite* is an organism that lives inside or on a host. The host can be any living plant or animal. The parasite takes its food from the host. Some worms are common parasites found in food. When they enter your body, you become the host. The most common source of parasites is raw or partly cooked meat and fish.

One of the most well-known parasitic worms found in food is *trichina*

(*trick-EYE-nah*). These roundworms cause a disease called *trichinosis* (*trick-ih-NOE-sis*). You can become infected with this worm by eating raw or partly cooked pork or wild game meat.

Trichinosis causes vomiting, diarrhea, nausea, fever, thirst, and chills. This disease makes it hard to talk, swallow, and breathe. It causes puffy eyelids and swollen, sore muscles. The symptoms appear within a few days to a few weeks.

Heat kills parasites. You can protect yourself from them by thoroughly cooking meat and fish. Avoid eating raw or partly cooked meat. If you become a host to parasites, see your doctor right away.

## Molds

*Molds* are fuzzy growths on the surface of foods. Molds can be any color. They spread to foods through the air. Some molds produce poisons. Their poisons are found below the mold you can see. Molds and their poisons can cause foodborne illness. To avoid mold growth, eat foods within a few days of buying them.

## Poisons

Foodborne illness may be caused by poisons, too. Some poisons are a natural part of plants or animals. Others get into food through accidental contamination from the environment.

## Natural Poisons

Certain plants and animals contain natural toxins. For instance, many mushrooms are tasty, while others contain a deadly poison. Poisonous mushrooms often look just like nonpoisonous ones. Poisonous and nonpoisonous mushrooms may grow side by side. Avoid picking wild



ADVENTURES IN FOOD AND NUTRITION

mushrooms, fruits, and berries unless you are an expert, 9-8.

A natural poison is also found in potato peels. The amount is small, but it increases as the potato sprouts. It also increases if potatoes are stored in a brightly lit place. You can avoid this poison by removing the peel, green spots, and sprouts.

### Poisons from the Environment

Toxic substances in the environment may get into foods through food containers, polluted water, and farming practices. Common toxic substances include lead and pesticides.

Lead is found in lead-glazed dishes, lead crystal glasses, lead solder, and old paint. The glazes on some handmade and old dishes often contain lead. Lead can leach out of lead glazes and crystal containers into food and beverages. Lead from solder can leach into food and beverages, too. In the past, lead solder was used to seal the seams of cans and copper water pipes. Lead solder is no longer permitted



*9-8 Dangerous or delicious?  
Only experts should pick wild  
mushrooms.*

in cans manufactured for packaging food in the United States. However, lead seams can still be found on some imported canned food products. Many older homes may still have lead-soldered water pipes. Food can also be contaminated if lead paint chips fall into it.

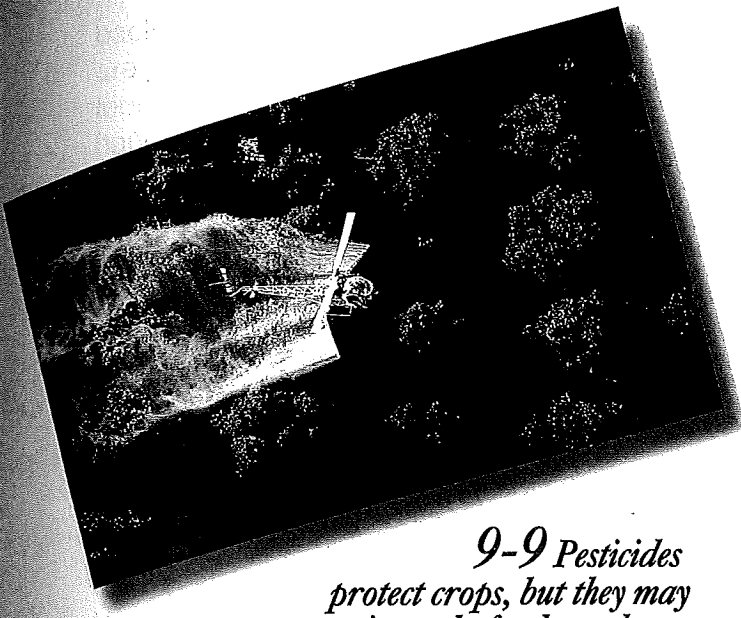
The symptoms of lead poisoning are headaches, vomiting, and diarrhea. Lead poisoning can cause muscles to waste. It can also lead to mental retardation.

You can reduce the amount of lead that enters your body by using lead-glazed dishes only for decorative purposes. Such dishes are often handmade, old, or have a dusty or chalky look. New dishes made by large companies in the United States no longer contain lead. Save lead crystal containers for special events. Never store food or beverages in lead crystal containers.

It is also a good idea to remove food from cans soon after opening them. Lead from the solder on some imported food cans can leach into the food if you store leftovers in the can. Lead also leaches into water when the water sits in pipes. If you have lead or copper pipes, let water run a minute or two before using it. The lead that leached into the water will go down the drain with the water. You should always choose lead-free paint for your home, too.

Pesticides used in farming are another type of poison that can enter food. These poisons are used to keep insects, mice, rats, weeds, and diseases from attacking crops, 9-9. The United States Government has strict controls on pesticides, but sometimes a small amount of some pesticides remains on crops. You can reduce the amount of pesticides in your food by washing raw fruits and vegetables well.

Symptoms of poisoning can occur within a few minutes. Sometimes symptoms



*9-9 Pesticides protect crops, but they may contaminate the food supply.*

take weeks to appear. If you think you have eaten a poison, see a doctor right away. Try to take along some of the food you ate. (Review the steps in Chapter 8 for dealing with poisoning.)

## What Should You do if You Think You Have a Foodborne Illness?

Most foodborne illnesses last a few days. The usual treatment is to rest in bed and drink plenty of fluids. Foodborne illnesses may keep a person home from work or school, but they are not a threat to the health of most people.

Foodborne illnesses can be very dangerous for some people. These victims of foodborne illness should see a doctor without delay:

- babies, children, and elderly people
- those who are sick with other diseases

- those with severe symptoms, such as a high fever, blood in the feces, constant vomiting and diarrhea, and dizziness
- those who don't recover within a few days
- those who think they have botulism

You or your doctor should report instances of foodborne illness to the health department. Health department workers will try to find out which food caused the illness, 9-10. Once they know the source of the illness, the workers can take steps to protect other people. For instance, if restaurant food caused the illness, the health department can order the restaurant to clean up. If a food in the supermarket is the



*9-10 Health department workers can often track down the cause of foodborne illnesses.*

problem, the health department can keep others from buying it and can tell others who already bought the food to return it.

## Keeping Food Safe to Eat

Keeping food clean and safe to eat is the responsibility of every person who handles food. That includes food producers, processors, shippers, food store workers, and you.

Some government agencies also work to keep the food supply safe and clean. These agencies include the U.S. Department of Agriculture, the Food and Drug Administration, and health departments. These agencies write and enforce strict rules. They inspect food-processing plants, food stores, and restaurants to be sure the rules are followed. One place they don't inspect is your kitchen. That's your responsibility.

Many cases of foodborne illness begin in home kitchens. It's up to you to prevent them. It's easy to protect yourself if you follow good sanitation rules. **Sanitation** means to study and use methods that create a clean, healthy environment. You can practice good sanitation if you follow the four rules shown in 9-11.

### Keep Yourself Clean

Bacteria are found on your body and clothes. These bacteria can get into food and cause foodborne illness. Chefs and other food workers must follow strict rules for keeping themselves clean. You can use the rules they follow to prevent foodborne illness.



*9-11 Follow the four basic food safety guidelines—clean, separate, chill, and cook—to keep foods safe to eat.*

Keep your hands clean. Your hands come in close contact with food. Even hands that look clean may be contaminated with harmful bacteria. It's easy to control the spread of bacteria from your hands. All you need to do is wash them before cooking. Scrub them for at least 20 seconds with plenty of hot, soapy water. Don't forget to wash between your fingers and scrub under your fingernails.

After washing your hands, try not to contaminate them again with bacteria. Your hands become contaminated every time you cough, sneeze, or use the bathroom. Touching raw meat or unwashed fruits and vegetables transfers bacteria to your hands, too. Bacteria also spread to your hands when you touch your face, hair, or pets. If you think your hands may be contaminated with bacteria, wash them right away.

Handle foods as little as possible. Even clean hands have small amounts of harmful

bacteria on them. Try not to touch food you are preparing. Use utensils to mix or turn foods. If you must touch foods with your hands, you might want to wear disposable plastic gloves.

Only touch the parts of dishes and utensils that don't come in contact with food. You can reduce the spread of bacteria by picking up forks, knives, and spoons by their handles. Try to pick up plates and bowls by their bottoms and edges. Avoid touching the rims and inside areas of cups and glasses.

Wear clean clothes. Bacteria on dirty clothes can get into food. Roll up loose sleeves to keep them from dipping into food.

Tie back your hair if it is long. If it is tied back, hair won't fall into food. Also, you will be less likely to touch your hair and contaminate your hands with bacteria.

If you sneeze or cough, turn away from food and cover your mouth and nose. The air you exhale carries bacteria that can get into food. Always wash your hands after sneezing or coughing.

Avoid working with food when you are sick. The germs causing your illness could get into food. You could infect the food and pass the germs on to others.

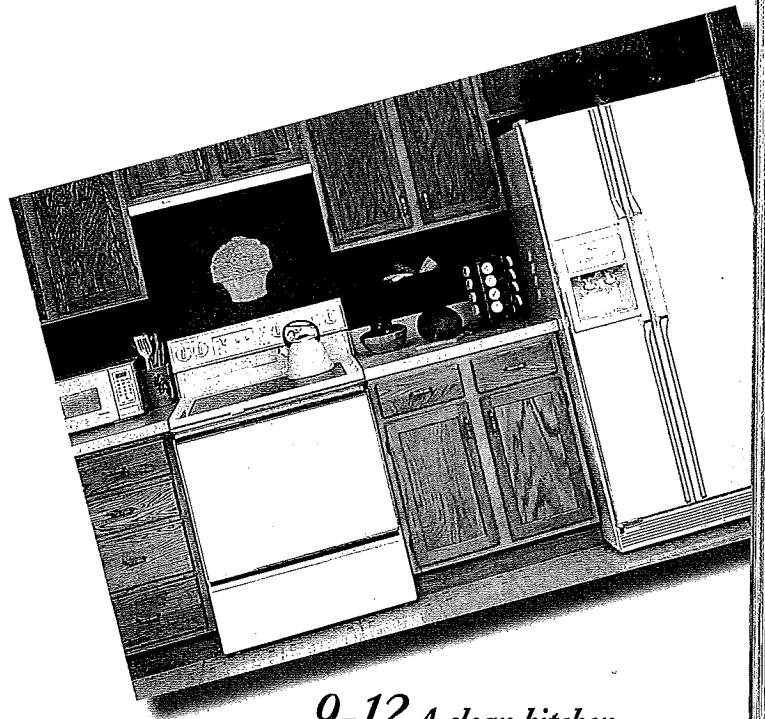
Cover open cuts and sores with a clean bandage. Open cuts and sores contain harmful bacteria that can cause foodborne illness. Never touch a wound while you are cooking. The liquid oozing from wounds contains harmful bacteria that will contaminate your hands. If you have a cut or sore on your hands or arms, protect the wound and food by wearing disposable plastic gloves.

## Keep Your Kitchen Clean

Bacteria thrive in damp, dirty areas of the kitchen. They love cracks and corners where food, moisture, and dirt collect. Pests, such as insects, mice, and rats, like dirty kitchens, too. They move in when crumbs, food spills, and garbage are left in the kitchen. These pests spread bacteria every place they go. They climb over counters, dishes, and food. Bacteria and pests don't like kitchens that are clean and dry. See 9-12.

Here's how you can keep bacteria under control and pests out of your kitchen.

- Wash work surfaces. Work surfaces include countertops, tables, and cutting boards. Wash them with soap and water and rinse well before using them. Clean them again after



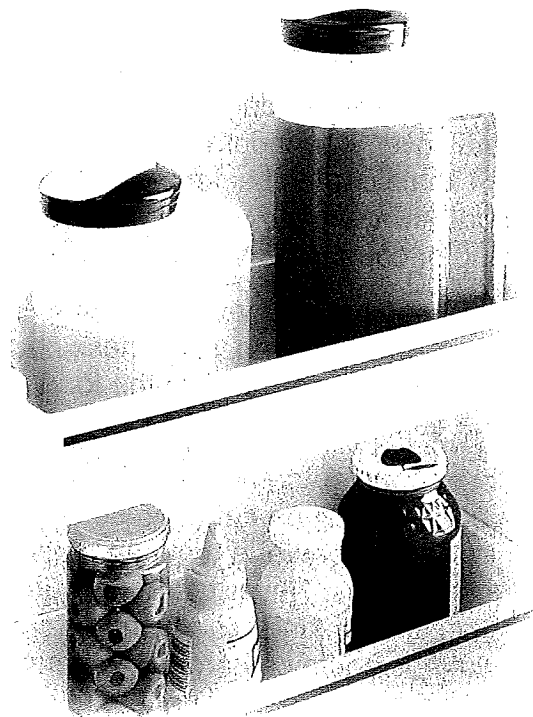
*9-12 A clean kitchen helps prevent foodborne illness.*

using them. Wooden cutting boards need special care. Bacteria like to nestle into the small, damp spaces of the scratches in wooden cutting boards. Damp plastic cutting boards provide an ideal breeding ground for bacteria. To kill the bacteria, wash cutting boards with a mixture of one cup of water and one tablespoon of bleach. Then wash them in the dishwasher or with hot, soapy water and dry them thoroughly.

- Consider using paper towels. If you use dishtowels and sponges, be sure they are clean. Bacteria thrive in damp or dirty dishtowels, so be sure to wash them often. After using a sponge, wash it in very hot, soapy water. This will kill many bacteria. Then rinse it with cold water, squeeze out the clean sponge, and let it dry. Wash dishtowels on the hot cycle of your washing machine.
- Wipe up spills as soon as they happen. Bacteria grow quickly in spills. Pests like to feast on spills.
- Keep pets out of the kitchen. Pet fur can carry harmful bacteria. Hairs may float in the air and get into food.
- Each time you taste a food during cooking, use a clean spoon. Bacteria can spread to food if the spoon is dirty. Always wash the spoon before using it again.
- Throw away foods in torn or damaged containers. Bacteria and pests can enter damaged or open food containers. The food inside the package may be spoiled or unsafe to eat. When you shop, reject open packages and leaking, dented, or bulging cans. Choose jars that are tightly closed. Some jars have a safety button on their lids. You know

the jar has been opened if the safety button has popped up. Soft, soggy, or stained frozen food packages are signs that food has thawed. When frozen foods thaw, bacteria begin growing right away. If you find foods in torn or damaged containers at the store, bring them to the attention of the manager.

- Clean out your refrigerator and freezer often. Discard spoiled foods. If you don't know how old the food is, don't take chances. Discard it. Often you cannot tell a food will cause foodborne illness just by looking at it or smelling it. The food may look, smell, and taste fine and still make you sick. See 9-13.



**9-13** *Keep your refrigerator clean and be aware of how long foods have been stored. To prevent foodborne illness, throw away foods if you are in doubt about how fresh or safe they are.*

## Every Drop Counts!

Water is a precious resource! Without water, we could live only a short time. Each person uses a large amount of water every day. Water is used to wash our clothes and dishes. We use it to keep ourselves clean. We need it to wash fresh fruits and vegetables and cook our foods. It is important to use only what we need. There are so many ways to save water. Here are some tips to help you save water in the kitchen!

A leaking faucet can waste almost 2,700 gallons of water every year. Check your faucets for leaks and repair them right away.

- If you aren't sure a food is clean or safe to eat, discard it. Foods that look or smell strange may not be safe to eat. Food from a can that spouts and sprays when you open it is not safe to eat. Dispose of these foods so no person or animal can eat them.
- Cover your garbage can with a tight lid. Empty it at least once a day. Garbage attracts pests and bacteria.
- Rinse empty food containers before recycling or discarding them. Bacteria and molds can grow on the tiny bits of food left in food containers. Also, the food and odors from dirty food containers attract pests.
- Sweep the floor. Crumbs make tasty morsels for pests and bacteria.

Don't let tap water run until it is cool enough to drink. Instead, store some in a jug in the refrigerator.

Thaw meat in the refrigerator or microwave not under running water.

Garbage disposals use lots of water. Compost food waste instead of using a garbage disposal.

Run your dishwasher only when it is full.

Be sure to conserve water in the laundry, bathroom, and outside, too!

## Separate: Don't Cross-Contaminate

Cross-contamination spreads bacteria from contaminated areas and items to clean food. Raw food and dirty hands, clothing, dish towels, sponges, utensils, and dishes all carry bacteria that can contaminate your clean food. You can take several steps to prevent cross-contamination.

- Never dry dishes with the same towel used to dry your hands. Bacteria from your hands are spread to the towel. These bacteria can end up on clean dishes if you dry dishes with the same towel. Some families have two colors of dishtowels. They use one color to dry dishes and the other color to dry their hands. This makes it easy to keep towels for dishes and towels for hands apart.

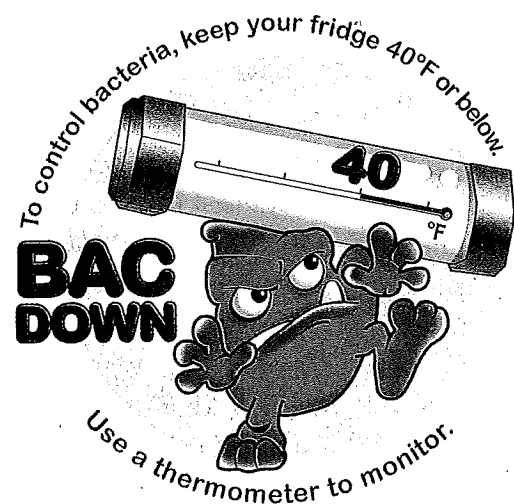
- Keep dirty items away from clean dishes and food. Bacteria can spread from dirty utensils and dishes to clean dishes and food. Put dirty dishes and utensils in the sink or dishwasher. If you wash them in the sink, use plenty of hot, soapy water. Then, rinse them in hot water. If you can, let dishes and utensils air dry. If you need to dry them quickly, use a clean dishtowel.
- Be sure to wash every item raw foods touch before using the item again. This rule will help you avoid cross-contamination. Keep in mind that raw foods carry bacteria that contaminate everything they touch. You can spread bacteria just by touching a clean food with an unwashed knife. A common cause of cross-contamination is placing cooked meat on the same unwashed plate used for raw meat.
- Raw meat, poultry, fish, and their juices often contain harmful bacteria. Therefore, separate raw meat, poultry, and fish from other foods in your grocery cart to prevent cross-contamination. Also, put raw meat, poultry, and fish on plates before refrigerating them. This will keep their juices from dripping on other foods.

## Chill and Cook: Keep Food out of Danger Zone Temperatures

Bacteria grow fastest at temperatures between 40°F and 140°F (5°C and 60°C). For safety, keep foods out of the danger zone. You can do this by serving cooked

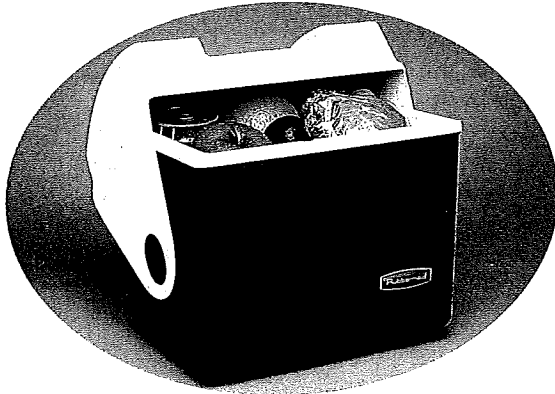
food while it's hot. Also, keep cold foods cold until you are ready to use them. The following tips can help you to keep foods out of danger zone temperatures.

- Store foods safely. Take groceries home right after shopping. Put frozen and refrigerated foods away as soon as you get home. It's a good idea to put a date on frozen foods so you know how old they are. Keep canned and dry foods in a cool, dry place. Bacteria prefer moist, warm places, such as those under a sink or above an oven. You'll learn more about storing food in Chapter 12.
- Keep cold foods in the refrigerator or freezer until you need them. Return them to the refrigerator or freezer as soon as you can. Refrigerator temperatures should be between 32°F and 40°F (0°C and 4°C). Keep freezer temperatures at 0°F (-18°C). You can check the temperature by keeping special thermometers in your refrigerator and freezer. See 9-14.



**9-14** *For safety's sake, check your refrigerator's temperature!*

- Sometimes cold foods will need to be out of the refrigerator for a few hours. Picnic foods and packed lunches are examples. These foods need to be kept cold, too. An insulated carrier with a cold pack inside keeps food cool for a few hours. Be sure to keep the carrier closed and out of the hot sun, 9-15.



*9-15 An insulated carrier helps keep packed lunches cool and safe to eat.*

- Thaw frozen food in a microwave oven or refrigerator. Letting food thaw on the countertop gives bacteria a chance to grow. Bacteria start growing on the outer parts of the food even before the inside thaws.
- Keep hot food hot until it is served. Hot means 140°F (60°C) or higher. Bacteria cannot grow above this temperature. Hot temperatures kill many bacteria and their toxins. If food cools slightly, it enters danger zone temperatures.
- Thoroughly cook meat, fish, poultry, and eggs. Cooking kills harmful bacteria. You're taking chances when you eat meat, poultry, fish, or eggs that are raw or only partly cooked, 9-16.

**"Is it done yet?"**  
You can't tell by *looking*. Use a **food thermometer** to be sure.

**USDA Recommended Internal Temperatures**

						
Steaks & Roasts <b>145 °F</b>	Fish <b>145 °F</b>	Pork <b>160 °F</b>	Ground Beef <b>160 °F</b>	Egg Dishes <b>160 °F</b>	Chicken Breasts <b>170 °F</b>	Whole Chicken <b>180 °F</b>

**[www.IsItDoneYet.gov](http://www.IsItDoneYet.gov)**  
USDA Meat & Poultry Hotline: 1-888-MPHotline (1-888-674-6854)

USDA United States Department of Agriculture  
Food Safety and Inspection Service

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July 2005

*9-16 Visit this website to learn more about food safety.*



- A food thermometer is the only way you can tell for sure that meat and poultry are safe to eat. The color of cooked meat can fool you. For instance, hamburgers may be brown and still be undercooked. Use a clean food thermometer to measure the internal temperature of cooked foods. The internal temperatures in 9-17 will help you know when food is safe to eat. Fish is done when it is opaque and you can flake it with a fork.
- Many eggs are contaminated with salmonella. These bacteria can grow inside fresh, unbroken eggs. You should cook eggs until the yolk and white are firm. Some older recipes, such as eggnog, may call for raw eggs. Don't use recipes in which eggs remain raw or only partly cooked. You'll learn more about preparing eggs safely in Chapter 22.
- Cool leftovers right away. Bacteria grow fast as hot foods start to cool. Leaving them at danger zone temperatures for more than two hours makes them unsafe to eat. Place leftovers in the refrigerator immediately. Don't leave them out to cool. You can speed the cooling of large amounts of leftovers by dividing them into small containers. Small amounts of leftovers cool faster than large amounts. Bacteria have less time to grow when foods cool quickly.
- Thoroughly reheat leftovers. Bacteria have a chance to grow while hot foods cool. Bacteria also can grow slowly in the refrigerator. Leftovers are safest to eat when they are heated to at least 165°F (74°C). You should boil leftover sauces, soups, and gravy.

**Thermometer Rules!**  
... for cooking foods at home.

145 °F	Beef, lamb & veal steaks & roasts, medium rare (medium 160 °F)
160 °F	Ground beef, pork, veal & lamb Pork chops, ribs & roasts Egg dishes
165 °F	Ground turkey & chicken Stuffing & casseroles Leftovers
170 °F	Chicken & turkey breasts
180 °F	Chicken & turkey whole bird, legs, thighs & wings

**FSIS**  
Food Safety and Inspection Service  
U.S. Department of Agriculture  
www.fsis.usda.gov

USDA Meat and Poultry Hotline  
1-800-535-4555 • TTY: 1-800-256-7072  
E-mail: mphotline.fsis@usda.gov

*9-17 Keep cooked foods safe to eat by using a food thermometer to make sure they have reached these recommended temperatures.*

## FOCUS ON FOOD

# Avoiding Foodborne Illness When You Eat Out

Restaurants must follow strict sanitation rules. Experts from the health department inspect restaurants to be sure the rules are followed. Sometimes problems occur and customers get a foodborne illness. You can avoid foodborne illness by asking yourself these questions before eating at a restaurant.

- Does the restaurant look clean?
- The tabletops should be clean. Look for clean walls and floors and tidy rest rooms.
- Are the workers healthy and neatly groomed? The workers should not appear sick. They should be wearing clean clothes. If they have long hair, it should be tied back. Make sure the workers do not touch the parts of utensils or dishes that will touch your food.
- Does the food look clean and smell fresh? Check to see that hot foods

are hot and cold foods are cold.

Take a close look at salad bars and hot buffets. Salad bar foods should be kept chilled. Hot buffet foods should be hot, not warm. Make sure custard and cream pies are refrigerated. Be extra careful if you are buying milk or sandwiches from a vending machine. Check the dates on the foods. If the date has passed or the food is not cold, don't eat it.

- If you have any leftovers, take them home right away. They need to be put in the refrigerator within two hours of the time the food was served. Be sure to reheat leftovers well before eating them.

If you have a problem with foodborne illness, call your local health department. They can look into the problem and warn others.

- If a firm-textured food has molded, remove a large area around the mold. The mold you see is only part of the problem. The poisons molds can form are found under the surface of the food. Sometimes you can save parts of molded bread, cheese, fruits, and vegetables by cutting off the mold. Discard the food if the

mold covers a large part of the food. Also, discard any soft or liquid foods that become moldy.

Now that you know how to keep food clean and safe, you're ready to begin preparing it. The next chapters will help you do just that.

## In a Nutshell

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- Many people become victims of foodborne illnesses every year. Foodborne illness is caused by pathogens that get into food you eat.
- Bacteria, parasites, molds, and poisons are pathogens.
- Bacteria grow quickly when foods are stored in danger zone temperatures.
- *Campylobacter*, *Salmonella*, and *Listeria* are bacteria that cause infections.
- *Staphylococci*, *Clostridium perfringens*, *Clostridium botulinum*, and *E. coli* are bacteria that produce toxins that cause poisonings. The virus that causes hepatitis is found in contaminated water. Worms are the most common parasites found in foods. Certain plants and animals contain natural poisons. Other foods may be contaminated by poisons from the environment.
- The treatment for most people with foodborne illnesses is to rest in bed and drink plenty of fluids.
- Most foodborne illnesses can be avoided if you keep yourself clean, keep your kitchen clean, and keep foods out of danger zone temperatures.

## In the Know

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1. Describe how cross-contamination occurs.
2. Which food is most likely to cause foodborne illness if left at room temperature for more than two hours?
  - A. A raw carrot.
  - B. A loaf of bread.
  - C. A bowl of pudding.
  - D. An open can of cola.
3. True or false? Almost all bacteria cause foodborne illness.
4. Danger zone temperatures range from \_\_\_\_\_ to \_\_\_\_\_.
5. \_\_\_\_\_ is a common source of *Salmonella* and *Campylobacter*.
  - A. Milk
  - B. Apples
  - C. Chicken
  - D. Honey