# Food Poisoning, Bacterial, Prevention and Treatment

Chemicals, heavy metals, parasites, fungi, viruses and germs (*bacteria*) can cause foodborne illness. Bacteria related food poisoning is the most common. Of the many thousands of different bacteria, fewer than 20 actually cause foodborne illness.

## CAUSES

Contamination of raw and cooked foods is caused by:

- Poor personal hygiene.
- Improper cleaning of storage and preparation areas.
- Unclean utensils.

Always clean thoroughly all surfaces that have been in contact with raw meat, poultry and eggs. Mishandling of raw and cooked foods allows bacteria to grow. The temperature range in which most bacteria grow is between 40° F (5° C) and 140° F (60° C). Raw and cooked foods should not be kept in this danger zone any longer than absolutely necessary. Undercooking or improper processing of home canned foods can cause very serious food poisoning. Since food poisoning bacteria are often present on many foods, knowing the characteristics of such bacteria is very helpful to prevent and control these possibilities.

## STAPHYLOCOCCUS AUREUS

A person's respiratory passages, skin and superficial wounds are common sources of *S. aureus*. When *S. aureus* is allowed to grow in foods, it can produce a toxin that causes illness. Although cooking destroys the bacteria, the toxin produced is heat stable and may not be destroyed. Staphylococcal food poisoning occurs most often in foods that require hand preparation. Examples are potato salad, ham salad and sandwich spreads. Sometimes these types of foods are left at room temperature for long periods of time. This allows the bacteria to grow and produce toxins. Good personal hygiene while handling foods will help keep *S. aureus* out of foods. Refrigeration of raw and cooked foods will prevent the growth of these bacteria, if any are present.

## SALMONELLA

The gastrointestinal tracts of animals and humans are common sources of *Salmonella*. High protein foods such as meat, poultry, fish and eggs are most commonly associated with *Salmonella*. However, any food that becomes contaminated and is then held at improper temperatures can cause salmonellosis. *Salmonella* is destroyed at cooking temperatures above 150° F (66° C). The major causes of salmonellosis are contamination of cooked foods and insufficient cooking. Contamination of cooked foods occurs from contact with surfaces or utensils that were not properly washed after use with raw products. If *Salmonella* is present on raw or cooked foods, its growth can be controlled by refrigeration below 40° F (5° C). Salmonella is also present in the feces of pets, birds, baby chicks and reptiles (turtles, lizards and snakes). People can become infected if they do not wash their hands after contact with pets or pet feces.

## CLOSTRIDIUM PERFRINGENS

*C. perfringens* is found in soil, dust and the gastrointestinal tracts of animals and humans. When food containing a large number of *C. perfringens* is consumed, the bacteria produce a toxin in the intestinal tract that causes illness. *C. perfringens* can exist as a heat-resistant spore, so it may survive cooking. It can grow to large numbers if the cooked food is held between 40° F (5° C) and 140° F (60° C) for a long time. Meat and poultry dishes, sauces and gravies are the foods most frequently involved. Hot foods should be served immediately or held above 140° F (60° C). When refrigerating large volumes of gravies, meat dishes, etc.; divide them into small portions. This way they will cool rapidly. The food should be reheated to 165º F (73.9° C) prior to serving.

## CLOSTRIDIUM BOTULINUM

Botulism has caused death in approximately 30% of the cases. It occurs mostly in home canned foods. *Cl. botulinum* can exist as a heat resistant spore. It can grow and produce in under processed, home canned foods. An affected food may show signs of spoilage such as a bulging can or odor. This is not true in all cases. So **canned foods should not be tasted before heating**. The botulinum toxin is destroyed by boiling the food for 10 minutes.

## VIBRIO PARAHAEMOLYTICUS

*V. parahaemolyticus* is found on seafood. It requires the salt environment of sea water for growth. *V. parahaemolyticus* is very sensitive to cold and heat. To destroy all of this bacteria on seafood:

- Store perishable seafood below 40° F (5° C).
- Then cook and hold the seafood above 140° F (60° C).

Causes of food poisoning from this bacterium include:

- Insufficient cooking.
- Contamination of the cooked product by a raw product.
- Improper storage temperature.

It is a major problem in countries where seafood is consumed raw. *Vibrio vulnificus* is another member of the vibrio genus that is found in the marine environment. *V. vulnificus* is becoming a more common problem. But, it can be controlled with proper cooking and refrigeration.

## BACILLUS CEREUS

*B. cereus* is found in dust, soil and spices. It can survive normal cooking as a heat resistant spore. Then it can produce a large number of cells if the storage temperature is incorrect. Starchy foods such as rice, macaroni and potato dishes are most often involved. The spores may be present on other raw foods such as meats and vegetables. Their ability to survive high cooking temperatures requires that cooked foods be served hot or cooled rapidly. This will prevent the growth of the bacteria.

## LISTERIA

In the past, most problems associated with disease caused by *Listeria* were related to cattle or sheep. Since it is widely spread in the environment, can survive long periods of time under adverse conditions and can grow at refrigeration temperatures, it is now recognized as an important foodborne pathogen.

- People with weakened immune systems (*immunocompromised*), such as pregnant women or the elderly, are highly at risk to get sick from *Listeria*. *Listeria monocytogenes* is the most consistently pathogenic species causing listeriosis. In humans, ingestion of the bacteria may not cause symptoms or it may cause a flu-like illness. A carrier state can develop. Death (*mortality*) is rare in healthy adults. However, the death rate may reach 30% in the immunocompromised, newborn, very young person or elderly.
- As mentioned earlier *Listeria monocytogenes* is a special problem since it can survive adverse conditions. It can survive for 100 days at 39.2° F (4° C), but only 5 days if held at 98.6° F (37° C).
- The *key point* is that refrigeration temperatures do not stop growth of *Listeria*. It is capable of doubling in numbers every 1.5 days at 39.5° F (4.2° C). Since high heat, greater than 170° F (77° C), will inactivate the Listeria organisms, post-process contamination from environmental sources then becomes a critical control point for many foods. *Listeria* will grow slowly at refrigeration temperatures, so it is best to not keep products in the refrigerator for too long.

## YERSINIA ENTEROCOLITICA

*Yersinia enterocolitica* is often involved in illness with very severe symptoms. The infection caused by this microorganism (*Yersiniosis*) occurs most commonly in the form of abdominal pain and diarrhea (*gastroenteritis*). Children are most severely affected. Symptoms are similar to appendicitis and have resulted in many unnecessary surgeries to remove the appendix. Recovery is generally complete in 1 to 2 days. Arthritis has been identified as an infrequent but significant after effect of this infection. This organism is often present in foods and usually does not cause disease. However, it has been associated with illness linked to raw or undercooked pork, unpasteurized milk and dairy products and contaminated water. Like *Listeria*, this organism is also one that can grow at refrigeration temperatures.

## CAMPYLOBACTER JEJUNI

- *C. jejuni* enteritis is primarily transferred from animal origin foods to humans in developed countries.
- Milk has been most frequently identified throughout the world to be a vehicle for *Campylobacter*. Poultry and meats (beef, pork, and lamb) are also major sources of and vehicles for this bacteria.
- Hygienic slaughter and processing procedures will prevent cross-contamination. Cooling and airing will decrease the amount of bacteria. Cooking meat and poultry products thoroughly, followed by proper storage, should help keep food safe and cause less contamination.

## ENTEROPATHOGENIC ESCHERICHIA COLI

- Enteropathogenic *E. coli* is a significant cause of diarrhea in developing countries and places of poor sanitation. It has been associated with "travelers' diarrhea."
- The major source of the bacteria in the environment is probably the feces of infected humans. But there may also be animal sources. Feces and untreated water are the most likely sources for contamination of food.
- *E. coli* can be controlled. Precautions should include adequate cooking. Also, avoid contamination of cooked meat by contaminated equipment, water or infected food handlers. Food service businesses should monitor proper cooking, holding times and temperatures as well as the personal hygiene and health of food handlers.

## PREVENTION

The first step in preventing food poisoning is to assume that all foods may cause foodborne illness. Follow these steps to prevent food poisoning:

- Wash hands, food preparation surfaces and utensils thoroughly before and after handling raw foods to prevent contamination of cooked foods.
- Keep refrigerated foods below 40° F (5° C).
- Serve hot foods immediately or keep them heated above 140° F (60° C).
- Divide large volumes of food into small portions for rapid cooling in the refrigerator. Hot, bulky foods in the refrigerator can raise the temperature of foods that are already cooled.
- Remember the danger zone is between 40° F (5° C) and 140° F (60° C).
- Follow approved home canning procedures. These can be obtained from the Extension Service or from USDA bulletins.
- Heat canned foods thoroughly before tasting.
- **When in doubt, throw it out.**
- Infants, older persons, women who are pregnant and anyone with a compromised immune system are especially susceptible to foodborne illness. These people should never consume raw fish, raw seafood or raw meat type products.
- You are the key to preventing foodborne illness. By observing the simple rules of good handling, you can stop food poisoning.

| **Bacteria Responsible** | **Description** | **Habitat** | **Types of Foods** | **Symptoms** | **Cause** | **Temperature Sensitivity** |
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| **Staphylococcus aureus** | Produces a heat-stable toxin. | Nose and throat of 30% to 50% of healthy population; also skin and superficial wounds. | Meat and seafood salads, sandwich spreads and high salt foods. | *Nausea* (feeling sick to your stomach), vomiting and diarrhea within 1 to 6 hours. No fever. | Poor personal hygiene and subsequent temperature abuse. | No growth below 40° F (5° C). Bacteria are destroyed by normal cooking but toxin is heat-stable. |

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| **Salmonella** | Produces an intestinal infection. | Intestinal tracts of animals and humans. | High protein foods - meat, poultry, fish and eggs. But could be found in any food. | Diarrhea, nausea, chills, vomiting and fever within 12 to 72 hours. | Contamination of ready-to-eat foods, insufficient cooking and contamination of cooked foods. | No growth below 40° F (5° C). Bacteria are destroyed by normal cooking. |
| **Clostridium perfringens** | Produces a spore and prefers low oxygen atmosphere. Live cells must be ingested. | Dust, soil and gastrointestinal tracts of animals and humans. | Meat and poultry dishes, sauces and gravies. | Cramps and diarrhea within 8 to 24 hours. No vomiting or fever. | Improper temperature control of hot foods and contamination. | No growth below 40° F (5° C). Bacteria are killed by normal cooking but a heat-stable spore can survive. |
| **Clostridium botulinum** | Produces a spore and requires a low oxygen atmosphere. Produces a heat-sensitive toxin. | Soils, plants, marine sediments and fish. | Home-canned foods or improper food handling. | Initial symptoms of cramps, nausea, and vomiting. Symptoms may progress to blurred vision, difficulty swallowing, muscle weakness, paralysis, respiratory distress and possible death. | Improper methods of home-processing foods. | Type E and Type B can grow at 38° F (3° C). Bacteria destroyed by cooking and the toxin is destroyed by boiling for 5 to 10 minutes. Heat-resistant spore can survive. |
| **Vibrio parahaemo-lyticus** | Requires salt for growth. | Fish and shellfish. | Raw and cooked seafood. | Diarrhea, cramps, vomiting, headache and fever within 8 to 24 hours. | Contamination of cooked foods or eating raw seafood. | No growth below 40° F (5° C). Bacteria killed by normal cooking. |
| **Bacillus cereus** | Produces a spore and grows in normal oxygen atmosphere. | Soil, dust and spices. | Starchy food. May also be found in meats and vegetables. | Mild case of diarrhea and some nausea within 1 to 14 hours. | Improper holding and storage temperatures after cooking. | No growth below 40° F (5° C). Bacteria killed by normal cooking, but heat-resistant spore can survive. |
| **Listeria monocytogenes** | Survives adverse conditions for long time periods. | Soil, vegetation and water. Can survive for long periods in soil and plant materials. | Milk, soft cheese, vegetables fertilized with manure, deli meats and hot dogs. | Mimics meningitis (fever and headache). Immuno-compromised individuals most susceptible. | Contaminated raw products. | Grows at refrigeration temperatures of 38° - 40° F (3° - 5° C). May survive minimum pasteurization temperatures of 161° F (72° C) for 15 seconds. |

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| **Campylobacter jejuni** | Oxygen sensitive, does not grow below 86° F (30° C). | Animal *reservoirs* (sources) and foods of animal origin. | Meat, poultry, milk and mushrooms. | Diarrhea, abdominal cramps and nausea. | Improper pasteurization or cooking and cross-contamination. | Sensitive to drying or freezing. Survives in milk and water at 39° F (4° C) for several weeks. |
| **Yersinia enterocolitica** | Not frequent cause of human infection. | Poultry, beef and swine. Isolated only in human pathogen. | Milk, tofu and pork. | Diarrhea, abdominal pain and vomiting. Mimics appendicitis. | Improper cooking and cross-contamination. | Grows at refrigeration temperatures of 35° - 40° F (1° - 5° C). Sensitive to heat at and above 122° F (50° C). |
| **Enteropathogenic E. coli** | Can produce toxins that are heat stable and others that are heat-sensitive. | Feces of infected humans. | Meat and cheeses. | Diarrhea and abdominal cramps. No fever. | Inadequate cooking and contamination of cooked product. | Organisms can be controlled by heating. Can grow at refrigeration temperatures. |

## TREATMENT

Treatment for most bacterial (germs) food poisoning includes:

- Rest.
- Replacement of fluid loss as necessary.
- Antibiotics usually are used only in severe cases.

Preventive measures in the home include:

- Thorough cooking and prompt refrigeration of meats and eggs.
- Washing cooking surfaces and utensils that may have been contaminated by uncooked meats or eggs.
- Careful and frequent hand washing.

## HOME CARE INSTRUCTIONS

Small amounts of fluids should be taken frequently. Large amounts at one time may not be tolerated. Plain water may be harmful in infants and the elderly. Oral rehydrating solutions (ORS) are available at pharmacies and grocery stores. ORS replace water and important electrolytes in proper proportions. Sports drinks are not as effective as ORS and may be harmful due to sugars worsening diarrhea.

- As a general guideline for children, replace any new fluid losses from diarrhea and/or vomiting with ORS as follows:
  - If your child **weighs 22 pounds or under** (10 kg or less), give 60-120 mL (1/4 - 1/2 cup or 2 - 4 ounces) of ORS for each episode of diarrheal stool or vomiting episode.
  - If your child **weighs more than 22 pounds** (more than 10 kgs), give 120-240 mL (1/2 - 1 cup or 4 - 8 ounces) of ORS for each diarrheal stool or episode of vomiting.

- In a child with vomiting, it may be helpful to give the above ORS replacement in 5 mL (1 teaspoon) amounts every 5 minutes, then increase as tolerated.
- While correcting for *dehydration* (loss of body fluids), children should eat normally. However, foods high in sugar should be avoided because this may worsen diarrhea. Large amounts of carbonated soft drinks, juice, gelatin desserts and other highly sugared drinks should be avoided.
- After correction of dehydration, other liquids that are appealing to the child may be added. Children should drink small amounts of fluids frequently and fluids should be increased as tolerated.
- Adults should eat normally while drinking more fluids than usual. Drink small amounts of fluids frequently

and increase as tolerated. Drink enough water and fluids to keep your urine clear or pale yellow. Broths, weak decaffeinated tea, lemon lime soft drinks (allowed to go flat) and ORS replace fluids and electrolytes.

**Avoid**:

- Carbonated drinks.
- Juice.
- Extremely hot or cold fluids.
- Caffeine drinks.
- Fatty, greasy foods.
- Alcohol.
- Tobacco.
- Too much intake of anything at one time.
- Gelatin desserts.

- *Probiotics* are active cultures of beneficial bacteria. They may lessen the amount and number of diarrheal stools in adults. Probiotics can be found in yogurt with active cultures and in supplements.
- **Wash hands well to avoid spreading the bacteria.**
- Anti-diarrheal medications are not recommended for infants and children.
- Only take over-the-counter or prescription medicines for pain, discomfort or fever as directed by your caregiver. **Do not give aspirin to children** because it may cause Reye's Syndrome.
- For adults with dehydration, ask your caregiver if you should continue all prescribed and over-the-counter medicines.
- If your caregiver has given you a follow-up appointment, it is very important to keep that appointment. Not keeping the appointment could result in a chronic or permanent injury, and disability. If there is any problem keeping the appointment, you must call back to this facility for assistance.

## SEEK IMMEDIATE MEDICAL CARE IF:

- You or your child is unable to keep fluids down.
- Vomiting or diarrhea develop and or become persistent.
- Belly (*abdominal*) pain develops, increases or localizes.
- You or your child has an oral temperature above 102° F (38.9° C), not controlled by medicine.
- Your baby is older than 3 months with a rectal temperature of 102º F (38.9º C) or higher.
- **Your baby is 3 months old or younger with a rectal temperature of 100.4º F (38º C) or higher.**
- The diarrhea becomes excessive or contains blood or mucus.
- You or your child develops excessive weakness, dizziness, fainting or extreme thirst.
- You or your child has no urine for 8 hours.

## MAKE SURE YOU:

- Understand these instructions.
- Will watch your condition.
- Will get help right away if you are not doing well or get worse.

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