Section 1: Food Programs and Food-Borne Illness

Why study food safety?

"...our food fills an important need in our community...that's all we need to know.'

Actually, that isn't all you need to know. There are many reasons food programs should be concerned about food safety.

- Providing safe food is as important as providing the food itself.

A hungry person is more likely to consume food they wouldn't normally choose. If this food is unsafe, it can cause food-borne illness. Food-borne illness affects 48 million Americans per year. It can lead to serious discomfort, life-threatening complications, and even death.

- Unsafe food could injure the food program and its donors.

The Good Samaritan Law, which protect food donors and emergency food programs, does not excuse ignorance of food safety practices, especially if that ignorance results in personal harm. *For further information, review the WFC handout on the legal analysis of the Good Samaritan Act.* One publicized food-borne illness could result in loss of donations and community support.

Helping people in need is what food programs are all about. Ironically, those people who are most in need may be the most affected by careless handling of food. Food-borne illnesses can be deadly for people whose health is already at risk.

- **Malnourished people** (with long-term poor nutrition) are at greater risk of food-borne illness because of damaged immune systems.
- **Young children** are at higher risk because their immune systems are not yet fully developed.
- **Pregnant women** may pass any food-borne disease they encounter to the fetus. In some cases this can cause miscarriage or stillbirth.
- **Senior adults** may be at risk because of weakened immune systems, malnutrition, less ability to smell or see food spoilage, physical changes such as reduced stomach acid, poor circulation and weakened kidneys make food-borne illnesses harder to fight.
- **Chronically ill people** with immune deficiencies due to cancer, AIDS, kidney or liver disease, diabetes, or similar disorders are often difficult to treat for the symptoms of food-borne illness (vomiting, diarrhea, dehydration, etc.). As a result, their systems are weakened, hastening the progress of their disease or leading to death.
- **All at-risk people** who encounter food-borne illness may contract complications such as reactive arthritis, kidney failure, nervous system damage, progressive joint and spine disease, meningitis, and other chronic or life-threatening diseases.

"...no one has ever complained about becoming sick from our food. We don't have contamination problems."

Again, people with health problems or chronic illness due to malnutrition are likely to think of the symptoms of food-borne illness as a part of everyday life. They are not likely to associate these symptoms with food, and are even less likely to follow through and report a suspected problem.

Bacteria, one of the most common causes of food-borne illness, are found everywhere. It would be difficult, if not impossible, to find food that did not contain some bacteria. Any institution that deals with food has the potential for contamination. Bacteria only become a problem, however, when they multiply to sufficient numbers to cause an illness (the exception being virulent bacteria such as E. coli, which can cause serious illness even in a low dose). The best way to avoid the dangers of food-borne illness is to handle food safely in order to minimize the chance that bacteria will multiply. This manual is designed to help you avoid food-borne illnesses in your food program.

What is food-borne Illness?

Food-borne illness is any disease caused by a micro-organism or foreign substance in food. Food-borne illness normally produces flu-like symptoms lasting a few hours (Staphylococcal intoxication) to a few months or years (Botulism).

This Section describes the micro-organisms that cause food-borne illness. Micro-organisms produce food-borne illness either by causing infections or intoxications.

Infections happen when enough live micro-organisms have reproduced in food or have been transferred from food to the intestines where they have produced an "infective dose" (the dose at which a person becomes ill). The severity of infection is decided by:

- the number and virulence (strength) of the micro-organism,

  and

- the resistance of the victim.

Intoxications are caused by a toxin (poison) that is produced by bacterial cells. The amount of toxin is determined by the number of bacteria. Cooking or reheating food may or may not kill harmful micro-organisms or toxins. Some spore-forming organisms as well as some toxins are heat stable.

The human body can (and does every day) handle small numbers of most micro-organisms.

What causes food-borne Illness?

Food-borne illness may be caused by micro- organisms (organisms too small to see) or by chemical or physical contamination of food (such as pesticides or glass chips). Contamination will be covered later in this Section.

There are four general types of micro-organisms which cause food-borne illness.

1. **Bacteria** are single-celled organisms which may live in animals, water, soil or food. Toxins are generally more heat resistant than the bacteria themselves.
   Bacteria are small: you could fit more than 100 million bacteria on a single grain of sugar.
2. **Viruses** are even smaller than bacteria, and can only reproduce once they are inside a living cell (like a human). Viruses are often found in untreated water and on the unclean hands of food service workers.
3. **Molds** can live in soil, water, plants or animals. They grow by absorbing organic material from their host.
4. **Parasites** live inside animal and human hosts and absorb nutrients to complete their life cycle. Parasites are most often found in meat and fish products, however they can also be found in fruits and vegetables exposed to contaminated water.

Each type of micro-organism operates differently within a human host. In order to simplify things, the rest of this Section will deal mostly with bacterial growth. Keep in mind, however, that the same methods for controlling food-borne illnesses caused by bacteria will also apply to illnesses caused by other micro-organisms.

What types of food- borne illness and food poisoning could be found in food programs?

Food programs handle a variety of food: from dry goods and vegetables to milk, meats, frozen products and prepared restaurant or deli food. Illnesses associated with these foods are explained on the following pages.

This information may change your ideas about food-borne illness. For example, not all food-borne illnesses show up immediately. Hepatitis may take up to 50 days. And not all food-borne illnesses produce only flu-like symptoms. Food-borne illness can produce a range of different symptoms. Some food-borne illnesses can kill!

Infectious Hepatitis

- Organism: Hepatitis A virus
- Source: Infected workers (human feces, urine or blood), contaminated water, insects, rodents.
- Common Foods: Foods not cooked after handling such as baked products, luncheon meats, salads, raw vegetables, sandwiches, fruits.

- Symptoms: Fever, appetite loss, nausea, fatigue, jaundice, darkened urine, enlarged liver.
- Prevention: Good worker hygiene, minimized contact of hands with food, separation of infected persons from food preparation, proper sewage treatment, thorough hand washing –especially after using the toilet, bare hand contact with foods, and restricting any food handlers from working if they have any symptoms of hepatitis A or if they have been exposed to someone who has the disease.
- Note: Signs of hepatitis may take 15 to 50 days to appear and may last for weeks or even months. Also, a food worker can spread the disease well before they actually have any of the symptoms themselves so good handwashing and avoiding bare hand contact needs to happen at all times.

Norwalk Virus

- Organism: Norwalk virus, also known as Norovirus
- Source: Hands of infected food workers, sewage, contaminated water.
- Common Foods: Foods not cooked after handling such as baked products, luncheon meats, salads or coleslaw, raw vegetables, sandwiches, fruits. May also be found in contaminated water or ice.
- Symptoms: Diarrhea, nausea, vomiting, abdominal pain, headache and fever. May cause dehydration or death among elderly or immuno-compromised people.
- Prevention: Good personal hygiene by workers (like frequent hand washing), minimized contact of hands with food, separation of infected persons from food preparation (ill food workers should stay home), safe water sources, clean utensils and surfaces, thorough cooking, rapid cooling, prevention of cross-contamination.
- Note: 60 to 80% of people exposed to Norwalk virus become sick!

Botulism

- Organism: Clostridium botulinum bacteria
- Source: Soil, dust, intestinal tract of animals.
- Common Foods: Improperly canned foods (beans, pepper sauce, tomatoes and tomato juice, salmon, asparagus, etc.), foods held at room temperature in low-oxygen environment (for example, baked potatoes).
- Symptoms: Headache, dizziness, tiredness, double vision, muscle weakness, and difficulty speaking, swallowing and breathing. Death is likely without an antitoxin!
- Prevention: Do not distribute home-canned foods, do not use swollen or damaged cans, prepare food safely and store foods properly in the refrigerator. Do not create low-oxygen, risky temperature environments (such as leaving tinfoil-wrapped baked potatoes at room temperature). Put all foods in the refrigerator immediately.
- Note: Botulism may already be present on food you receive or may be introduced at your facility. The key to prevention is understanding what food practices are risky (see Sections #3 and #4) and keeping food refrigerated.

Cereus Bacillus

- Organism: Bacillus cereus bacteria
- Source: Soil, dust, water.
- Common Foods: Cereal and rice dishes, macaroni and cheese, spices, dairy products, soups, sauces, potatoes and meat.
- Symptoms: Abdominal pain, nausea, vomiting, diarrhea.
- Prevention: Keep hot foods hot (>140°F) and cold foods cold (<41°F). Eliminate room temperature storage. Do not let leftovers sit out. Put all foods in the refrigerator immediately. Cool all leftovers quickly in shallow pans at a food depth of 2 inches or less.

Trichinosis

- Organism: Trichinella spiralisparasites
- Source: Muscle of meat-eating animals.
- Common Foods: Raw pork and wild game.
- Symptoms: Flu-like symptoms, fever, puffy eyes, sweating, weakness, muscle pain, toxemia, myocarditis (inflammation of the heart muscle).
- Prevention: Prevent cross contamination, freeze suspect meat products 10-20 days before cooking. Cook meat to 160°F.

Staphylococcal Intoxication

- Organism: Staphylococcus aureus bacteria
- Source: Skin, nose, throat and nasal passages (cough and sneezes), hands, hair, sores, infected cuts, pimples, raw milk, sewage.

- Common Foods: Dairy products, poultry, meats, tuna, sandwich fillings, pies, salad dressing, luncheon meats and hot dogs.
- Symptoms: Nausea, vomiting, diarrhea, cramps.
- Prevention: Keep ill workers away from foods, wash hands and utensils before preparation or handling food, minimize contact of hands with food, make sure that all workers with sores on their hands wear gloves. Chill foods rapidly, keep hot foods hot (>140°F) and cold foods cold (<41°F).
- Note: At warm temperatures, Staphlococcus aureus produces a poison (toxin) that is NOT destroyed by cooking. Staphlococcus aureus is found on the mucous membranes of 30 to 50% of the population.

Salmonellosis

- Organism: Salmonella species bacteria
- Source: Intestines of infected humans and animals, handling reptiles (turtles, snakes, iguanas).
- Common Foods: meat, eggs, poultry, fish, cream desserts, dairy products, sprouts, melons.
- Symptoms: Vomiting, diarrhea, nausea, , headache, fever and dehydration. May trigger arthritis.
- Prevention: Wash hands and utensils before preparation or handling food, prevent cross-contamination, cook foods thoroughly. Keep hot foods hot (>140°F) and cold foods cold (<41°F).
- Eliminate room temperature storage. Do not let leftovers sit out. Put all foods in the refrigerator immediately. Cool all leftovers quickly in shallow pans at a food depth of 2 inches or less. Use only pasteurized milk and milk products.

Campylobacterosis

- Organism: Campylobacter jejuni bacteria
- Source: Infected humans or animals, soil, water, handling reptiles (turtles, snakes, iguanas).
- Common Foods: Meat, poultry, fish, raw dairy products.
- Symptoms: Vomiting, diarrhea, nausea, fever, bloody stools. May cause meningitis and arthritis.
- Prevention: Don't drink or clean with untreated water. Prevent cross contamination (especially with raw chicken), cook foods thoroughly. Wash hands and utensils before preparing or handling food. Keep hot foods hot (>14O^{o}F) and cold foods cold (<41°F). Eliminate room temperature storage. Do not let leftovers sit out. Put all foods in the refrigerator immediately. Cool all leftovers quickly in shallow pans at a food depth of 2 inches or less. Use only pasteurized milk and milk products.

Listeriosis

- Organism: Listeria monocytogenes bacteria
- Source: Soil, intestinal tract of animals.
- Common Foods: Unpasteurized milk, cheeses, cut vegetables, cabbage, meat, poultry, cold smoked fish, luncheon meats and hot dogs.
- Symptoms: Headache, fever. May cause blood poisoning, meningitis, abortion, miscarriage, or death in immuno-compromised people.
- Prevention: Practice good stock rotation. Keep lunch meats and hot dogs a cold as possible. Clean work surfaces and equipment just before using. Use only pasteurized milk and milk products. Keep cold foods below 41°F. Prevent cross contamination.
- Note: Listeria can grow in cold temperatures (34°F) and in foods containing salt. Almost 25% of listeria cases end in death.

Yersiniosis

- Organism: Yersinia enterocolitica bacteria
- Source: Intestinal tract of animals.
- Common Foods: Meat (especially pork and poultry), raw milk, vegetables, tofu, contaminated water, chocolate milk.
- Symptoms: Fever, bloody stools. May cause blood poisoning, arthritis, liver disease, meningitis.
- Prevention: Clean work surfaces and equipment just before using. Wash hands and utensils before preparaing or handling food. Keep cold foods below 41°F, prevent cross contamination.

Shigellosis (Bacillary dysentery)

- Organism: Shigella species bacteria
- Source: Intestinal tract of infected people.

- Common Foods: Milk, dairy products, poultry, potato salad, other salads, seafoods, ready-to-eat foods. Also, foods not cooked after handling - like baked products, luncheon meats, raw vegetables, fruits.
- Symptoms: Fever, abdominal pain, pus or blood in stools, secondary infection.
- Prevention: Handwashing, minimize contact of hands with food, keep cold foods below 41°F. Prevent cross contamination.
- Note: Shigella is often passed when infected workers handle food. Food workers with diarrhea should stay home.

E. Coli 0157:H7

- Organism: E. coli. 0157:H7 bacteria
- Source: Intestinal tract of animals and humans, water supplies contaminated by animal or human sewage.
- Common Foods: Meats (especially ground beef), poultry, raw milk and cheeses, raw vegetables, melons, sprouts, salami, unpasturized fruit or vegetable juices.
- Symptoms: Bloody stools, cramps, urinary infection and kidney failure, strokes, seizures, coma and death.
- Prevention: Prevent cross contamination, keep cold foods below 41°F. Wash vegetables thoroughly, wash hands after using toilet, use clean water for all food preparation and dishwashing, wash and sanitize utensils between use, control insects (especially flies) and rodents. Use only pasteurized milk and milk products

Chemical Food Poisoning

Chemical foodborne disease is caused when poisonous substances are added to food. The two major causes of chemical food poisoning are metals and chemical products.

Metals:

When acid foods are stored and/or prepared in equipment containing cadmium, lead, tin and zinc, some of the metal dissolves into the food and can cause chemical poisoning.

Chemicals:

Chemical compounds (such as cleaners, detergents, sanitizers, pesticides and food additives) can be deadly when used for the wrong purpose or in excessive amounts, or when accidentally added to food.
Symptoms: Convulsions, burning of the mouth, throat or stomach lining, death.

Prevention:

1. Use glass/plastic containers to store acidic foods.
2. Do not spray or apply pesticides where food could be affected by the chemicals. Use only “food friendly” pesticides approved by the FDA or EPA and follow package directions.
3. Wash all raw fruits and vegetables.
4. Keep rodent poisons away from food areas.
5. Store all substances appearing to be food (like salt/sugar- looking cleaning powders) well away from food.
6. Never store chemicals or cleaners in old food containers.

Naturally Occurring Food Poisoning

There are several hundred naturally occurring toxins that either contaminate food (such as molds) or are a normal part of the food (such as poisonous fish or mushrooms).

The most common sources of food poisoning are rhubarb leaves, certain types of house plant leaves and berries, wild celery, green or sunburned potatoes and poisonous mushrooms. Toxins can also be found in sassafras, mace, nutmeg, moldy grains and peanuts, raw rutabagas, turnips, broccoli, kale, soybeans, pure licorice extracts, certain types of tea, spinach, lettuce and beets.

Symptoms: Rashes, dizziness, jaundice, vomiting, severe headache, constipation, collapse, and death. Repeated exposure remains undetected for several years.
Prevention: Never accept foods about which there is any question of safety.

Personal Approach

Now that you've been introduced to food-borne illness, think about how it could affect your food program by answering the following questions. Make copies of this page for others you want to give the test to.

1. Choose 2 or 3 different foods stocked by your food program and list all food-borne illnesses which could affect them (see example below).

Item	Possible Illness
A. Chicken	*Staphylococcus, Salmonellosis, Campylobacteriosis, Listeriosis, Yersoniosis, Shigellosis, Hemorrhagic Colitis, Chemical Food Poisoning*
B.	
C.	
D.	

2. Which at-risk populations does your food program serve? How would a food-borne illness affect them?

3. What are the most serious consequences of food-borne illness?

How Do We Control Bacterial Growth?

Inness-causing bacteria are found everywhere (in the air, soil, dust, and water; on most surfaces; in animals and people) and can be transmitted to almost any food. Foods then provide the essential nutrients and moisture for bacterial growth.

Bacteria need several things in order to reproduce:

- Temperature. Ideally between 41 and 140°F. Some grow at other temperatures.
- Water or moisture.
- Food. Although bacteria can grow on any food, they especially like high protein foods such as milk, meat and eggs.
- Time. Given the right conditions, just 1 bacteria can produce 33 million bacterial cells in 12 hours.
- Other conditions, such as the level of oxygen and the right chemistry (for example, acidity or salt).

Preventing food-borne illness requires either killing bacteria or slowing their growth (often by controlling temperature and time) enough to prevent an infective dose of bacteria or toxins. An example of slowing bacterial growth is proper refrigeration.

→ Although most microbes do not die when refrigerated or frozen, they do stop reproducing.

The easiest way to prevent food-borne illness is to prevent or control bacterial growth by:

- Temperature control
- Providing a clean and sanitary environment for storing and processing food
- Inspecting donations for contamination
- Determining how long food may be stored and proper stock rotation
- Proper food preparation (specifically in repackaging food)

Section 1 Self Test

1. Why is food safety important at a food program?

2. What is a food-borne illness?

3. What is an “infective dose”?

4. Can all food-borne illnesses be controlled by cooking food?

(Hint: think about “toxins”.)

5. Which food-borne illnesses can be controlled by good worker hygiene?

6. What conditions do bacteria need in order to reproduce?

Note: This series was designed for common food program procedures. Food programs which engage in perishable food recovery or hot food programs should contact their local health department or health district for additional training.