Introduction

According to Centers for Disease Control and Prevention (CDC), each year
- Over 76 million people become sick due to foodborne illnesses (1 out of 4 people in the US!)
- Over 325,000 people are hospitalized
- Over 5,000 people die
As a result, the food service industry pays an average of $74,000 for each incidence.

Some people are more vulnerable than others to foodborne disease, generally because their immune systems are weakened. And if they become sick with a foodborne illness, these people can face serious health consequences.

But these risks can be reduced. You can help protect yourself—or people you care for—by knowing and following basic rules of food safety.

There are four groups of people who are more vulnerable to foodborne disease:

1) Senior citizens
2) Pregnant women
3) Very young children
4) People who suffer from weakened immune systems or chronic illnesses, such as cancer, diabetes, liver disease and AIDS

Why are these people more vulnerable to foodborne disease? What are the possible consequences for them? And most importantly, how can they avoid foodborne illness?

This booklet provides these answers. So take a look. Don't take a chance. Take control! Help reduce risks of foodborne disease.

Food Sanitation 101

A food safety management program is an organized system developed for all levels of food operation. Only a good program and training on cleaning, sanitizing, and food safety can provide your customers safe food which should be the Certified Food Manager's first responsibility.

As managers/supervisors in food service establishments, you have responsibilities that extend beyond cost control and profits. The safety of the consumer should be your first concern. This safety includes the facility itself, the food you serve, and the employees who are under your supervision.

In any establishment that prepares and serves food, the manager is responsible for the sanitation program, direction of personnel, and control of costs. Supervisors and food handlers, who are responsible for helping the manager, need to know how to serve safe food.

A certified food handler must be able to acquire and demonstrate competency in the following areas:
- Identify foodborne illness
- Identify time/temperature relationship with foodborne illness
- Describe the relationship between personal hygiene and food safety
- Describe methods for preventing food contamination
- Identify and apply correct procedures for cleaning and sanitizing equipment and utensils
- Recognize problems and potential solutions associated with facility, equipment, and layout
- Recognize problems and potential solutions associated with housekeeping and maintenance
Your knowledge of how food becomes contaminated and how to prevent foodborne illness is vital to the success of your job. You will avoid complaints, liabilities, the closing of your food service establishment and most importantly, a bad reputation. *(The average liability of a foodborne illness is about $74,000).*

According to the CDC (Center for Disease Control), the most common reason for foodborne illness is inadequate cooling and poor refrigeration.

**Sources of Hazards**

**Food can be contaminated in the following four ways:**

a) **Physical Contamination** is caused when hair, glass, metal, shavings, broken objects, dirt, etc. gets into food.

b) **Biological Contamination** is caused by harmful bacteria, virus, fungi or parasites that get into food.

c) **Chemical Contamination** is caused when substances such as cleaning compounds, acids, detergents, soaps, chemicals, and pesticides get into food.

- **Toxic Metals:** Metals such as copper, brass, tin, or galvanized metals can become toxic when they come in contact with acidic foods like lemonade, sauerkraut, dressing or vinegar. Avoid using copper, zinc, brass and peltre pots on industrial stoves. Enamelware also can be dangerous because it may be plated with antimony or cadmium. *If toxic metals are used with acidic food products, toxins may be produced, this is an example of chemical contamination.*

- **Acidic Foods =**

- **Additives:** The excessive use of additives may also be a source of chemical contamination. You must not apply sulfites to foods. Avoid adding large amounts of additives to foods (i.e. MSG).

d) **Cross Contamination:** is caused when bacteria or harmful microorganisms cross or transfer from one place to another. One example of this is when the same cutting board is used to cut raw chicken and then raw vegetables without washing in between.

**SEPARATE**

Don't cross-contaminate.
Human beings carry a minimum of 150 billion bacteria which makes us the major hazard against food, especially our hands. Bacteria, viruses, and parasites usually come from people who improperly handle food, and from microorganisms that are already in the food when we receive it.

- If we leave food out in the Danger Zone (41°F - 135°F) the bacteria will multiply in great numbers.
- The maximum accumulated time that food can remain in the Danger Zone is 4 hours; remember that the higher the temperature, the shorter the amount of time food can be left outside. (During optimal bacterial growth temperature, one bacterium will become 4,000 bacteria in 4 hours).

1. Bacteria

Bacteria are the most common microorganisms that affect food. They live and can multiply anywhere and they can grow on food. Other microorganisms like viruses or parasites will not grow on food.

- Food - especially food that is high in protein such as milk, meat, fish, or eggs
- Moisture — they like foods with plenty of water
- Warm temperatures - 70°F - 135°F
- Time — they need time to reproduce
- Adequate pH — 4.6 – 7.5, they do not like very acidic foods

The types of food in which harmful bacteria can grow are called PHF – potentially hazardous foods (chicken, eggs, cheese, shellfish). Even cantaloupes and watermelons are classified as PHF because they have plenty of water, not too acidic, and have the nutrients that bacteria needs to grow.

Freezing, refrigerating, and drying foods do not kill bacteria. This only keeps them in a dormant or hibernating state. As soon as you thaw or take food from the refrigerator, the bacteria will continue to grow and double in number every 20 minutes which is the way bacteria reproduces itself.

When bacteria are multiplying, it consumes the nutrients in foods, and then produces waste products or metabolic by-products called toxins. These toxins may look and feel like slime, such as the one formed on old fish or meat. Toxins cannot be killed with heat or cold; this is the reason why food that does not smell good or feels slimy, cannot be fixed under any circumstances. If ingested, these toxins will produce intoxication in people.

Not all metabolic by-products are undesirable. Some are beneficial, like the ones produced by bacteria used to prepare cheese, yogurts, sour cream, and similar foods.

Spores

Some bacteria have the ability to change into forms that are very resistant to heat and dry conditions. They are called spores and are characterized by the formation of a thick "shell". Bacteria that have turned into spores will not reproduce in that state, but once they sense good conditions, they will return to the bacteria state again and continue to multiply. Spores may be formed in improperly processed home canned foods; therefore that type of food
Alkaline (Base)

cannot be purchased by a food service establishment. All the food for sale to the public has to be purchased from an approved source or has to come from a commercial kitchen.

pH = Food Acidity and Alkalinity
Bacteria will grow best when food is slightly acid, neutral, or slightly alkaline, and contains enough water for its growth. The measure of acidity or alkalinity is called pH. Food which has been assigned a number below 7 is acid, if more than 7, it is alkaline, and if it is 7, neutral. The area of concern is the zone between 4.6-7.5. Foods rich in acid such as citric juices, dressings, and mayonnaise do not support bacterial growth.

Remember, bacteria can exist in a number of different places, but some bacteria are known to be found in certain food products

Salmonella bacteria
Found in human intestines, in domestic and wild animals, especially poultry, eggs and their shells. Also found in pets, roaches and rodents. The foods that can be contaminated include meat and poultry that are not cooked at the required temperatures. They can also be found in unpasteurized milk and dairy products. Salmonella can be killed in poultry by cooking at 165°F for 15 seconds.

Shigella bacteria
Found in the human intestines. Most foodborne illnesses caused by this microorganism are the result of not washing the hands after using the bathroom and then touching food that will not be cooked. This bacteria may produce dysentery in humans.

E. Coli bacteria
Found in human intestines and that of warm-blooded animals. It can contaminate food and water. Although most E. Coli will not cause problems, some types can cause serious diseases such as the one termed O157:H7. It is found in ground beef that has not been cooked at 155°F for at least 15 seconds. It can produce death in children and elderly people.

Listeria bacteria
Found anywhere, especially in lunch and deli meats. They are naturally found in the soil, water, animal feed and in the intestine of humans and animals. Also found in unpasteurized milk and its products, and in vegetables grown in contaminated soil. They can grow at temperatures below 41°F. Seventy percent of refrigerators in the United States have listeria. To prevent the spread of listeria inside the refrigerator, keep all foods covered. It can produce abortions, stillbirths, and birth defects if listeria contaminated food are ingested by pregnant women.

Staphylococcus aureus bacteria
Most common cause of foodborne illness. It is found on the skin, nose, and mouth of 50-70% of all people. It is easily transmitted by sneezing, coughing, scratching skin, and touching hair. It is found especially in infected cuts and burns. Once on food, they multiply and produce toxins. Heat cannot kill toxins produced by this bacteria. Staphs are also unique because they can grow in foods that do not have a lot of water such as hams and custards. It can be transferred to food by the improper cleaning and sanitizing of food preparation utensils and equipment.

Bacillus cereus bacteria
Found in soil where vegetables and grains are grown. It forms spores and can be found on cooked rice that has been improperly cooled or held hot.

Clostridium botulinum bacteria
Microorganism responsible for causing botulism. It forms spores and grows only where there is no air (anaerobic). It is found in the soil, lakes, human intestines, fish, swollen cans, vacuum packed foods, and smoked meats. It is commonly found in vacuum packed and home-canned foods. Leftover baked and wrapped potatoes have to be refrigerated overnight to avoid botulism. Because spores are so difficult to kill, botulism is a very dangerous and harmful bacteria. ANY FOODS SUSPECTED OF HAVING BOTULISM SHOULD BE DISCARDED IMMEDIATELY.
Vibrio bacteria
Commonly found in raw, underprocessed, improperly handled, and contaminated fish and shellfish (clams, oysters, crabs, shrimp, and lobster). Because this bacteria requires salt to grow, is not found in still, clear waters or meat or poultry. It is highly resistant to salt and is more common in the summer months and in seafood harvested from warmer waters. **Individuals with particularly low immune systems or diagnosed with liver disease should avoid consuming raw oysters and clams (the risk of death is almost 200 times greater).**

2. Viruses
Viruses are microorganisms that will cause illnesses, but do not reproduce on food. They only use food as a means of transportation. They are 100 times smaller than bacteria, and can only reproduce in living cells, human beings, plants, or anything that is alive. They can be excreted in human feces, urine, or the respiratory tract. Failure to wash hands after using the bathroom, coughing, sneezing and wiping a runny nose are ways to spread contamination.

**Hepatitis A (also called infectious hepatitis)**
Produced by a virus. It is found in the human intestines and urine of an infected person. Poor personal hygiene is the leading cause of Hepatitis A. **WASH YOUR HANDS!!!**

**Norwalk Virus**
Believed to cause large amounts of viral illnesses. It lives in the human intestinal tract. Raw salads, raw vegetables, prepared salads, raw shellfish and contaminated water may be the source of this type of contamination.

The most likely food to transmit viral illness are those that are not heated or cooked after handling (sandwiches, milk, water, fruits, raw oysters and clams).

3. Parasites
Parasites are organisms that live within or feed off another organism. They are usually larger than bacteria, but can be very small too.

**Trichinella**
Parasite *found in pork that produces trichinosis*. **We must pay special attention to this parasite. Although the incidence of finding this parasite is not very high, it is very dangerous. We can kill trichinella by cooking pork to 145°F for 15 seconds.**

**Anisakis**
Parasite *found in fish and seafood* that produces anisakiasis. Coughing is the most common symptom if the worms attach themselves to the throat. **Parasites can be killed if food is cooked well or if frozen at -4°F for 7 days or -31°F for 15 hours.**

4. Other

**Seafood toxins**
Some fish and shellfish can become poisonous when they eat poisonous plankton or toxic algae in warm waters. Do not eat shellfish during a red tide.

**Scombroid Poisoning**
Most common reported cause of seafood illness. It is produced when fish like mahi-mahi and tuna begin to spoil from being time/temperature abused.

**Ciguatera**
A type of seafood poisoning. The cause is not the fish, but what the fish eats. The small fish eats algae that may contain ciguatoxin. The bigger fish eats the smaller fish and then gets contaminated. **Seen in tropical predatory fish such as snapper and barracuda.**
Molds
A natural part of many food products such as cheese. They rarely cause foodborne illnesses but are responsible for much of food spoilage.

- Some molds can produce toxins, molds can be **killed by heating foods to 140°F for 10 minutes**, but this process will not destroy their toxins (remember, toxins can never be killed!).
- Freezing prevents growth of molds, but has no effect on the mold spores that are already present in the food.
- Mold can grow at temperatures below 41 °F (In the refrigerator, you may see mold grow on cheese).

Yeasts
Commonly used in the production of breads and in the processing of beer and wine. They do not produce foodborne illness, but can ruin foods like sauerkraut, fruit juices, syrups, honey, jellies, etc. Yeasts can be killed by heating foods to 136 °F for 15 minutes and can be controlled by proper cleaning and sanitizing.

**ANY PERSON EXPOSED TO, CARRIES, OR DIAGNOSED WITH SALMONELLA TYPHI, SHIGELLA, E. COLI, OR HEPATITIS A VIRUS MUST BE REPORTED TO HEALTH OFFICIALS. INDIVIDUALS CARRYING CONTAGIOUS DISEASES MAY RETURN TO WORK ONLY UPON PHYSICIAN’S WRITTEN APPROVAL.**

5. Foodborne Illness Classification

Food infection
An illness produced by ingestion of living, harmful organisms which are present in food. These organisms such as bacteria, viruses, or parasites will multiply in the body and cause sickness.

(Not cooking food product to their required temperature, as a result → the organism(s) inside the food is not killed
Someone gets sick → Food infection)

Food intoxication
An illness produced by ingestion of bacterial toxins or excrements that is present in food before it is eaten. Intoxication may also occur from consuming foods that contain chemicals from cleaning agents, pesticides or certain metals.

(Leaving potentially hazardous food product at room temperature, exposing it to the danger zone →
Toxins are formed → Someone gets sick → Food Intoxication)

Food Products: Quality & Standards

Beef
*Look for bright red color, firm flesh, good smell, and a circular stamp on the box (USDA Inspection).* Grading for quality is voluntary. Check temperature below 41°F. Vacuum packed meats may be purple upon receipt. They will turn red again when exposed to air, a natural process called blooming. Ground meats spoil faster. Sausages with evidence of slime or mold should be rejected.

Poultry
Look for good smell, temperature 41°F or less. Grade A is the best. Poultry should be placed on crushed ice. *Avoid darkened wing tips, and soft or sticky flesh.*
Seafood
Buy only from approved suppliers. *Fish should be delivered and stored in crushed ice.* Receiving temperature should be 41°F or less. Fresh fish has bright skin, gills that are moist and red, and scales firmly attached. Eyes must be clear and bulging. Flesh must be firm and elastic. Look for signs of worms, diseases and tumors.

Clams and Oysters
Must come from approved sources. Fresh shellfish must be alive when delivered, and should not have a strong odor. They must be kept in the original container until you use them all.

*ID TAGS that come with crustaceans must be saved for 90 days.* In case of foodborne illness outbreak, ID tags may be used to identify the source of contaminated shellfish. Must be received at 41°F or below (Experior) or 45°F or below (Servsafe).

Milk and Dairy Products
*All milk and milk products must be pasteurized, Grade A, and must be received under 41°F.* Check expiration dates. Products labeled UHT do not need refrigeration until opened. Butter and cheese should be checked for any signs of contamination.

Keep milk products in the refrigerator at all times 41°F or less. Milk must be served from the original container in which it was packed at the milk plant. Dry milk has to be refrigerated after it has been reconstituted.
When serving ice cream from a bulk pack, the ice cream scoop must be kept in a dipper well with running water. It can be kept also in the food with the handle outwards or clean and dry. Self service of hard ice cream is not permitted.
➢ Butter or margarine provided to customers for self-service should be individual servings

Egg and Egg Products
Federal recommendations state that since eggs are PHF, they have to be received, transported and stored at 41°F or less (Experior) or 45°F or less (Servsafe). Damaged or dirty eggs should be rejected.
Many health departments recommend the use of liquid eggs. Liquid, frozen and dry eggs must be pasteurized. The use of pasteurized eggs is very much recommended and required for recipes that need none or little cooking. An example of this is Caesar salad and Hollandaise sauce.

Fruit and Vegetables
The best indication of quality is taste. *All produce must be thoroughly washed in clean potable water before serving.* This reduces possible contamination by soilborne bacteria (listeria bacteria) or chemical residue from pesticides.

Ice
Ice for use as food or for cooling other foods must be made from drinking water. *Do not allow the handling of ice with hands, glasses, or anything else besides an approved scoop, and keep it on top of the ice machine in a clean and sanitary container.*

Modified Atmosphere Packaging (MAP)
is a process whereby foods are placed in containers and air is removed from the package. *Sous-vide* ("without air") products are vacuum packed foods that come precooked. They have to be kept frozen or at 41°F or less in the refrigerator. *Because botulimum is a bacteria that grows in products with no air, discard any vacuum packed foods that have any signs of "bulging".*
Canned Foods

**BOTULISM CAN OCCUR IN CANNED OR VACUUM PACKED FOODS, AND IT IS EXTREMELY DANGEROUS.** Check for swollen cans, leakage, broken seals, dents along seams, rust or missing labels. Reject the cans if any of these conditions are detected.

Dry Foods

They include such products as cereals, flour, dry fruits and vegetables. Be sure that these foods are in good condition, and dry upon receiving. Look for punctures, tears, holes or slashing in the packages. Apply the rule of FIFO to dry food storage as well.

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**HACCP = A Food Protection System**

**HACCP (Hazard Analysis Critical Control Point) is a system designed to be used to maximize food safety.** The concept is: You identify the hazards or problems and then monitor the Critical Control Points that can control the hazards. The HACCP concept combines principles of food microbiology, quality control and risk assessment. The use of HACCP changes the emphasis of today's health inspections from the traditional clean facility type inspection to one that focuses more on the specific steps that provide safe food, such as temperature control and time of exposure of food in the Danger Zone (Remember the 2 T's: Time & Temperature Control!)

**Hazards:**

The most frequently found hazards
- Improper cooling procedures,
- Holding prepared foods too long,
- Poor personal hygiene
- Failure to rapidly reheat food before serving and improper hot holding.

**Analysis:**

The concept of analyzing hazards is based on the fact that some foods offer a better phase for growth of microorganisms than others. These foods are called potentially hazardous foods. Foods that are classified as potentially hazardous provide ideal conditions for the growth of harmful bacteria. These foods include products that have available water, neutral pH or slightly acidic or slightly alkaline food products.

**Critical Control Points:**

CCP (Critical Control Point) is an operation at any “point” (practice, pre-step procedure) by which a preventive, or control measure can be applied that would eliminate, prevent, or minimize a hazard(s).

**Corrective Action** – A CCP is to hold stew at 135°F. If the temperature falls below the 135°F the corrective action would be to return it to the stove and reheat it to 165°F.

**Major Principles Involved in Operating a HACCP System:**

1) Assessing hazards at each step in the flow of food, from receiving to serving, and then to develop the procedures to lower the risk for each step.

2) Identify the Critical Control Points (CCP)

3) Setting up control procedures and standards for CCP.

4) Monitoring CCP.

5) Taking corrective action, if there is a break in the procedures set up at a Critical Control Point.

6) Developing a record keeping system that documents the HACCP plan.

7) Verifying that the HACCP system is working.

From receiving to serving, all potentially hazardous foods (PHF) should follow specific steps within the guidelines set using time and temperature control.
Food Handling

Controlling food temperature is perhaps the most effective way to ensure that food is safe to eat.

1. Receiving
Incoming shipments of food must be inspected for spoilage, and other signs of contamination. Things that must be checked are: weight, appearance, quality, quantity, expiration date, and temperatures. Cold food should arrive at 41°F or less and frozen food should arrive at 0°F or less; hot food at 135°F or more. In order to check the temperature of incoming shipments of food without opening individual packages, you may place the tip of a thermometer between two packages or fold the product onto the thermometer.

Packaged foods should be checked for any kind of defect such as leaks, bulges, dents, broken seals, rust, or missing labels. Reject packages that are damaged, patched or taped shut.

Deliveries should not be scheduled during busy hours of the day when employees cannot check incoming shipments of food properly.

Frozen foods received with the formation of large ice crystals at the bottom of the package is a sign that the product has been refrozen. Reject the box or shipment.

2. Storing Foods
FIFO – The most important rule for storing is First-In-First-Out. This means that food has to be used in the order in which it is received.

Whenever possible, store foods in their original packaging. Take special care in repacking the product. Clearly label repackaged foods. Make sure chemicals and foods are stored separately to avoid possible chemical contamination.

Refrigerated Foods
Keep refrigerated foods at 41°F or below. Refrigerators should have a working visible thermometer at all times and be checked regularly. Always refrigerate meats, poultry, fish, and other PHF foods. Fresh fish has to be stored using correct ice down method. Do not refrigerate food if you do not have to like carrots, bananas, onions, apples, pears, citrus fruits, and potatoes. Do not overload refrigerators. Overloading of refrigerators can lead to inadequate temperature control.

Keep raw foods separately from each other. Store raw foods at the bottom of refrigerator and cooked foods on the upper shelves, always on top of raw food. (Remember, uncooked eggs should be stored below cooked foods).

Frozen foods
Keep all frozen foods between 0°F and −10°F. Do not thaw (defrost) and refreeze foods. Only refreeze if the product is cooked. Keep defrost cycle of freezers short so food will not thaw.

Dry Foods
Place dry foods in a storeroom between 50°F and 70°F with relative humidity away from sunlight.
Dry foods should be placed on slatted shelves at least six inches off the floor and away from the wall to minimize rodent or pest activity. Do not use toilet rooms, locker areas, mechanical rooms, and similar spaces for storage of food, single-service items, paper goods, or equipment and utensils. Protect dry foods from any kind of contamination: dripping, condensation, or leakage from overhead plumbing pipes. Do not expose products to overhead water and sewer lines unless the lines are shielded to interfere with potential drips.

To ensure proper air circulation throughout, keep all refrigerated foods, freezer, storeroom and kitchen foods at least six inches off the floor.

3. Defrosting Foods
There are five methods to correctly defrost/thaw foods:
1) Take food from freezer and place it in the lower part of refrigerator
2) Leave food in a clean and sanitized sink under cold running water (2 hour maximum time for this method)
3) Use microwave only if food is going to be cooked right away
4) Place food in a clean container of cold water, only if you are planning to change the water every one to two hours.
5) Defrost during a conventional cooking method, i.e. frying, boiling, broiling, etc.

4. Preparing Foods
Careful preparation is the key to serving safe food. Preparation is the time when food has a greater chance of getting contaminated. Through all stages of food preparation and service monitoring, the employee's health, personal hygiene and hand washing is important. Humans provide an ideal environment for the growth of microorganisms. Prevention is the best way to avoid foodborne illnesses.

Employee's Health
Nausea, vomiting, cramps, and diarrhea are common symptoms of foodborne illness. Employees who show signs of illness or oozing burns and cuts should be reassigned to other jobs but food handling, or rather be sent home.

People can also be carriers of disease-producing microorganisms and not be sick themselves. Carriers may not show any symptoms whatsoever.

Researchers have concluded that the HIV microorganism that causes AIDS is not spread by food. Employees infected with AIDS should not be restricted from work unless they have another illness or cut that may contaminate food.

Personal Hygiene
Practicing good hygiene means good health habits including bathing, washing hair, wearing clean clothing, and frequent hand washing. Poor personal habits are serious hazards in food establishments. Saliva, sweat, and other body fluids can be harmful sources of contamination if they get into food.

- Improper food tasting should be strictly prohibited. Harmful germs can be transferred to food when an employee uses a utensil more than once to taste food.
- Eating, drinking, and smoking should only be done in designated areas (a food worker's fingers may become contaminated during these activities).
- Hair should be properly restrained to prevent contamination of foods
- The most important thing we should teach our employees is proper hand washing, Never wash hands in the food preparation sink.
- Food service employees must have short and clean nails, no nail polish, and no fake nails. The excessive use of jewelry in the food service personnel is prohibited.
- Gloves can cause contamination just like hands, treat them like second skin. Whenever hands should be washed, you should use a new pair of disposable gloves. When changing from old gloves to new gloves or putting gloves on for the first time, you must wash your hands.
- Street clothes can carry contaminating media to food, equipment, and preparation surfaces. It's a good practice to get employees to change into their working clothes in the dressing room of the establishment. It is not recommended to allow employees to work in their street clothes.

[Image of proper hand washing and clothing guidelines]
Handwashing
Proper handwashing includes:
❖ Using warm water, as hot as you can stand.
❖ Using soap on your hands and scrubbing all the way to the elbows. Using a nail brush for your nails.
❖ Washing a minimum of 20 seconds and doubling the time to 40 seconds if you use the toilet.
❖ Using only disposable paper towels or the hot air machine to dry your hands. After you finish drying your hands with the paper towel, use it to shut the water off.
❖ Hand sanitizing lotions and chemical hand sanitizing solutions may be used by food employees in addition to handwashing. Hand sanitizing lotions should never be used in place of handwashing.
In conjunction with proper handwashing, fingernails should be trimmed, filed, and maintained so that handwashing will effectively remove soil from under and around them.

When preparing foods, follow these simple rules:
❖ Maintain proper personal hygiene
❖ Handle food with bare hands as little as possible
❖ Use disposable gloves
❖ Use thermometers

5. Cooking Foods
There are two main reasons why we cook food:

a) To make food more tasty by changing its appearance, texture, and aroma.
b) More importantly, to heat foods and destroy harmful microorganisms that may cause illness.

Using a thermometer is the only reliable way to check the internal temperature of foods. With the exception of pasteurized eggs and rare roast beef, all foods like poultry, meat, and fish should be cooked to at least 140°F or above for 15 seconds. Breaded or battered meats must be cooked thoroughly. DO NOT HOLD UNUSED BATTER AND BREADING MIXTURES OVER FOR THE NEXT DAY, they must be discarded.

<table>
<thead>
<tr>
<th>Food Product</th>
<th>Minimum Internal Temperature</th>
<th>Minimum Time Held at Internal Cooking Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poultry (chicken, turkey, duck)</td>
<td>165°F</td>
<td>15 seconds</td>
</tr>
<tr>
<td>Stuffed Meats</td>
<td>165°F</td>
<td>15 seconds</td>
</tr>
<tr>
<td>Soups, Stews</td>
<td>165°F</td>
<td>15 seconds</td>
</tr>
<tr>
<td>Ground Beef, Ground Pork</td>
<td>155°F</td>
<td>15 seconds</td>
</tr>
<tr>
<td>Beef Roast (medium), Pork Roast, Ham</td>
<td>145°F</td>
<td>3 minutes</td>
</tr>
<tr>
<td>Pork</td>
<td>145°F</td>
<td>15 seconds</td>
</tr>
<tr>
<td>Beef, Pork</td>
<td>145°F</td>
<td>15 seconds</td>
</tr>
<tr>
<td>Fish, Seafood</td>
<td>145°F</td>
<td>15 seconds</td>
</tr>
<tr>
<td>Eggs</td>
<td>145°F</td>
<td>15 seconds</td>
</tr>
<tr>
<td>Beef Roast (rare)</td>
<td>130°F</td>
<td>112 minutes</td>
</tr>
</tbody>
</table>

***Rare beef roasts require the least internal temperature requirements because the contamination is on the surface of the large roast. When an internal temperature of 130°F for 112 minutes or 145°F for 3 minutes is reached, the surface temperature of the food is much higher.***
Although fruits and vegetables are not considered potentially hazardous, they should be cooked to reach an internal temperature of 135°F or above.

**Microwave cooking**

When cooking foods in the microwave oven, the distribution of heat is often uneven. To ensure proper cooking, you must achieve a minimum internal cooking temperature of 165°F for foods cooked in a microwave. This provides an extra margin of safety.

### 6. Cooling Foods

According to CDC, inadequate cooling and improper refrigeration are the main causes for food contamination in the United States.

Bacteria will reproduce in foods if left outside to cool before refrigeration. Foods must pass through the temperature danger zone as quickly as possible. The Food Code recommends that potentially hazardous foods, should be cooled from 135°F to 70°F within 2 hours, and from 70°F to 41°F or below within an additional 4 hours.

There are three recommended cooling methods:

1) Divide large quantities of food into smaller portions

   - Place food in shallow containers of 4" deep or less and refrigerate immediately, uncovered in the upper part of the freezer or refrigerator, and then cover and transfer to the refrigerator, once food has cooled down. (41°F)
   - Large amounts of meat, can be sliced into smaller pieces

2) Use ice bath by placing pans of food into larger containers filled with ice and stirring the contents.

3) Use specially designed refrigerators to chill food quickly.

*DO NOT COOL FOODS AT ROOM TEMPERATURE.* Properly label all foods in the refrigerator.

*DO NOT STORE RAW FOODS ABOVE COOKED FOODS, AVOID CROSS CONTAMINATION*

### 7. Holding Foods

During the time between cooking and serving, foods should be stored in equipment that keeps them above 135°F or below 41°F, the required temperatures at all times. *Never use steam tables, heat lamps or other holding equipment to reheat foods* (they do not reach 165°F in the required time). Holding equipment must have a thermometer. Stir food constantly to make sure they remain hot throughout. Keep food covered while holding and use batch cooking (cooking in small amounts) instead of large quantities when possible.

**Buffets**

Food should always be served in a way that prevents contamination. Keep buffet foods covered when possible. Install sneeze covers. Keep all hot foods at 135°F or more and cold foods 41°F or less.
Assign an employee to monitor buffet:

- Monitor temperatures of food constantly using an approved and calibrated thermometer.
- Utensils used for buffets have to be kept inside the food to be served. Long handle buffet utensils are recommended. Use only one utensil per dish.
- Do not allow customers to reuse soiled tableware or dirty dishes again. Only cups and beverage glasses are permitted to be reused again. Provide condiments, seasonings, and dressings in individual packages or covered dispensers to avoid contamination. Unwrapped foods once served to the customer may not be re-served or re-used. It must be thrown away. An example of this is bread, butter, rolls and salsa.

8. Serving Foods

Some foods, like raw marinated fish, steak tartar, and raw shellfish have a greater chance for contamination; the 1997 FDA Food Code states that customers should be informed that they are taking a greater risk by ingesting these raw or undercooked foods. By doing so, you might reduce the impact of liability. Consider who your customers are.

When handling tableware and utensils, all items must be handled in a careful and sanitary way, before, during and after serving food.

To avoid possible contamination by hands:

- Do not touch eating surfaces of tableware.
- Hold plates and glasses by the bottom.
- Wash and store glasses upside down.

9. Food transportation

When food is transported, the risk of contamination is greater.

- Keep hot foods at 135°F or more and cold foods at 41°F or less at all times.
- Keep all foods in a tightly covered container.
- Potable (drinking) water must be available at the reception site.
- Non-potable (non-drinkable) water can only be used for air-conditioning systems and to fight fires.
- Clean and sanitized units are to be used to transport food.
- Food that has been exposed to sources of contamination should never be used again. REMEMBER THAT IT IS NOT ALWAYS POSSIBLE TO IDENTIFY FOOD OR CONTAMINATED FOOD BY APPEARANCE, SMELL, OR TASTE. IF IN DOUBT, THROW IT OUT!!!

10. Reheating Foods

When reheating leftovers (food can be reheated only once) bring them within 2 hours to a temperature of 165°F throughout for 15 seconds. If using a microwave oven, reheat to 165°F and allow to stand covered for 2 minutes after reheating. Do not reheat food in steam tables, warmers or using heat lamps. Always use the highest possible temperature for the shortest amount of time.
Cleaning, Sanitizing, and Pest Control

1. Cleaning and Sanitizing

Proper cleaning and sanitizing helps protect all who eat or work in a food service establishment. Cleaning is the physical removal of soil and food residues from surfaces of equipment and utensils. Cleaning alone is not enough to maintain a healthy food service establishment. We must sanitize to kill the bacteria that could contaminate food. By sanitizing we reduce the number of disease-causing microorganisms to safe levels.

- Use a three compartment sink to manually clean and sanitize equipment and utensils. Use hot water at 110°F (Experior) or 100°F (Servsafe) for washing and rinsing and cold water (70-75°F) for the third and last sink. Before beginning manual dishwashing, make sure to clean and sanitize each compartment of the sink.
- **FIRST WASH, SECOND RINSE, AND THIRD SANITIZE.**
- **AFTER SANITIZING, ALL EQUIPMENT MUST BE AIR DRIED:** no rags, no towels, and no paper.

There are two ways to sanitize in food establishments:

1) **Heat sanitizing** involves placing cleaned equipment and utensils in hot water of 171°F for 30 seconds.
2) **Chemical sanitizing** involves placing equipment and utensils in an approved chemical sanitizing solution for a minimum of 60 seconds at cool temperatures. It is important to remember, if the sanitizing solution temperature is too high, the sanitizer may evaporate from the solution.

**Factors that change the effectiveness of sanitizers**

- Soap or detergent residue can decrease the effectiveness of a sanitizing solution.
- The power of a chemical sanitizer also weakens as bacteria and other microorganisms are destroyed (sanitizing solutions should be replaced on a regular basis).
- A double concentration of the sanitizing solution on equipment too large for the sink or equipment considered food contact surfaces may increase the effectiveness but...More is not always better since high concentrations of sanitizer can become toxic.

**Approved Chemical Sanitizers**

1) Chlorine 50 ppm (most commonly used sanitizing agent)
2) Iodine 12.5 ppm
3) Quaternary Ammonium (Quats) 200 ppm (parts per million)

***To make one gallon sanitizing solution, mix one gallon of water with half an ounce of bleach/chlorox. In order to check for the correct concentration of sanitizing solutions, only test kits can be used.

**Other important tips for proper cleaning and sanitizing**

- Store clean sanitized equipment at least 6 inches off the floor.
Always disconnect all electric equipment before washing and sanitizing.
Use the right cleaning agent for the job and use the product correctly.
Cloths and sponges used for wiping equipment, utensils and food contact surfaces should not be used for any other purposes. *Keep wiping cloths in a container with a sanitizing solution.*

2. PEST CONTROL
Animals and pests can cause illnesses to people by contaminating food and food contact surfaces. *Animals are not allowed in food establishments unless they are being used for support or special service (i.e. guide dogs for the blind).* It is important that you do not touch animals during food preparation and service. If you touch an animal, for any reason, wash your hands before returning to work.

**Signs of pests:**
- Brown egg cases → Cockroaches
- Black pellets or droppings → Rat or mouse infestation
- Black rubmarks along the wall → Oil and filth from a rat’s body

The best way to keep pests out of your establishment is making sure they cannot get in. In other words, *prevention is the best method of pest control.*
- Do not leave food on floors.
- Eliminate areas where pests may hide.
- Make sure walls and floors have no holes that would allow the entrance of pests.
- Use screens for windows and doors.
- Keep the back of the establishment clean, organized and dry.

**Controlling Insects**
Many devices can be used such as zappers, traps, mechanical traps, repellants, sprays, and other kinds of insecticides. *Food must be removed or covered before an effective treatment can be done.* Use only insecticides approved for use in food service areas. Use poison or poison boards only as a last resort. Only a licensed PCO (Pest Control Operator) can apply insecticides.

**Storing Supplies**
Poisonous materials are prohibited in most areas of a food service establishment. Pesticides must be physically separated from other cleaners, sanitizers and toxic materials. *Chemicals such as cleaners and sanitizers should be stored away from food and food contact surfaces, if possible, away from dry storage areas.* Pesticides and poisons should be in locked places.

Employees have the right to know what kind of hazardous chemicals they are handling. *Material Safety Data Sheets (MSDS) educate employees about the chemical's ingredients, any information related to the chemical's ability to cause hazards, safe handling, as well as procedures to be taken in the event of an emergency.* MSDS are required to be kept on file at the food service establishment.

**Equipment, Facilities & Maintenance**

1. **Equipment and Utensils**
Food equipment requires the use of specialized equipment and utensils for cooking and serving.
- All equipment and utensils should be constructed and repaired with safe materials that are corrosion resistant, non-absorbent, smooth, easy to clean, and durable under normal use.
- Equipment must be heavy enough to withstand constant cleaning and sanitizing.
- Single service articles must be made from clean and sanitary materials and they cannot be reused.
- Food equipment can only be lubricated using approved lubricants.
All cutting boards have to be made of a hard wood, like hard maple or heavy duty plastic or rubber that is resistant to scratching, scoring, chipping and distortion.

Food contact surfaces must be easy to clean and sanitize. All food contact equipment and surfaces should be cleaned at least every 24 hours.

Stationary equipment has to be cleaned in place since they cannot be moved. Cleaning and sanitizing solutions can be circulated throughout fixed systems and must come into contact with all interior surfaces. Fixed equipment must be self-draining or capable of being completely drained of the cleaning and sanitizing solutions.

Food equipment, including icemaker, cannot be located under exposed pipes, unprotected sewer or water lines.

Equipment placed on tables should be sealed to the table or elevated on legs at least 4 inches from the table to allow easy cleaning of equipment and surrounding areas.

Floor mounted equipment, unless easily movable must be sealed to the floor, raised in a platform or elevated 6 inches from floor.

Refrigerators and Freezers
They must be made of durable materials that do not rust, doors that seal well and easy to clean surfaces. Interiors should have sufficient light, with bulbs protected against breakage. Refrigerators should be designed to keep food at 41°F or below. Temperatures should range between 38°F and 40°F. Monitor temperatures several times a day.

It is important to store foods in the correct part of the refrigerator. Label and date all foods. Use the FIFO rule: first-in first-out. Do not overload the refrigerator by storing unnecessary foods, such as onions, carrots, bananas and citric foods.

Keep doors closed as much as possible. Inspect doors for leaky or torn gaskets.

Dishwashing Machines
Each machine has its own operating procedures, which must be followed carefully. All employees who operate dishwashing equipment should be carefully trained.

Scrape and flush dishes only with hot water before placing them in the dishwasher.

Never overload dish washers. Keep dishwashers clean inside and out, including spray arms to make sure they are not clogged. This could create dirty dishes and spotty glasses with water stains.

Check the different cycles. Wash cycle should be between 140°F and 150°F, final rinse between 180°F and 195°F. Follow recommended temperatures for the kind of dishwasher you own.

Maintain line pressure between 15 and 25 pounds per square inch.

Thermometers
MUST BE USED TO CHECK THE TEMPERATURE OF INCOMING SHIPMENTS OF FOOD PRODUCTS, FINAL COOKING TEMPERATURES, TEMPERATURES IN THE REFRIGERATORS, FREEZERS AND HOT HOLDING UNITS.

Never use glass or mercury filled thermometers. They must be made of metal.

They must be at least 5 inches in length. They must be numerical and accurate to within +/- 2°F. They must measure between 0°F and 220°F.

Calibrating the thermometer ensures the thermometer reads accurately. You may calibrate the thermometer using boiling water (212°F) or crushed ice and water (32°F). Clean and sanitize thermometer after each use.

The first 2 inches of the thermometer (tip) is the sensitive part, so make sure to insert at least that much. Always insert the thermometer in the thickest part of the meat (i.e. the center of a turkey breast) and in at least 2 or 3 different places.

2. Facilities
In order for a food service establishment to be clean and safe, the facilities must be constructed with good ventilation and plumbing systems. Proper ventilation is
necessary to make sure employees are comfortable and provide a safe environment that is free of harmful odors and elements.

Walls and ceilings
Must be in good condition. They must be painted in a light color to make dirt and soil easier to detect and to allow thorough cleaning and sanitizing in the food preparation area. Hoods used for ventilation have to be in good repair and strong enough to prevent moisture or grease build-up on walls, ceilings, and equipment.

Floors
Should be smooth and properly constructed of non-absorbent materials such as sealed concrete, cement or quarry tile. Carpets are not allowed in the kitchen. Floors must be easy to clean and maintained in good condition. It is recommended to use mats on kitchen floors and they must be cleaned on a regular basis.

Utilities
Light fixtures, wall mounted fans, decorations, etc. should be easy to clean. Plumbing fixtures must not interfere in the proper cleaning of floors, walls, or ceilings. Electric wires and plumbing pipes should not be exposed in food handling or storage areas.

Lighting
It is important to have enough bright lights where food are handled and prepared. Light bulbs in the kitchen preparation areas should be shielded, coated, or otherwise shatter resistant.

3. Maintenance

Water supply
Potable (drinkable) water should be transported, handled, and dispensed in a sanitary manner. You may be able to work around some short time shut downs on the water supply by obtaining potable water from another place. You may use disposable tableware and kitchenware for short periods of time. However, you cannot continue operations if there is a plumbing failure, or you do not have water for extended periods of time. YOU MUST HAVE COLD AND HOT WATER AT ALL TIMES.

Cross-connection
The mixing of clean and dirty water in any way.

⇒ Backflow (an example of cross connection) is the flow of unsafe water into the supply of potable water, this must be avoided. (Hoses should not be attached to a faucet unless a vacuum breaker is installed, which is a valve that will prevent backflow).

⇒ An air gap is the best way to prevent back siphonage. An air gap is a space of air or separation between a supply of potable water and any possible source of contamination. The air gap must be at least twice the diameter of the water supply inlet or twice the diameter of the drain pipe from a three compartment sink, but a minimum of one inch.

Air Gaps must be used in all food preparation and food handling equipment including ice machines.
If grease traps or garbage grinders are used, they should be designed and located in an easy to clean manner. Do not let grease traps fill to the top; they have to be cleaned as often as necessary.

All sewage including liquid waste such as mop water should flow into a public sewer system. Any problems with the sewage system are a serious hygiene hazard. **WHEN PROBLEMS OCCUR, YOU MUST CALL THE HEALTH DEPARTMENT AND STOP ALL FOOD SERVICE OPERATIONS IF THERE IS ANY RISK TO PUBLIC HEALTH.**

**Waste Disposal**

Good management of waste minimizes attraction of insects, rodents, and other pests to the food establishment. Place a waste basket in each area of the food establishment where trash is regularly thrown away. **Store garbage in covered containers and use plastic bags before placing trash in the dumpster.**

Each food establishment should also have an outside storage area to maintain trash and recyclables. **Keep equipment and containers covered tightly to discourage insects and rodents.** Outdoor storage areas must be kept clean and free of trash.

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**First Aid/Fire Prevention**

**1. Accidents**

An important part of your job as a food manager is to make sure that the work place is safe for employees. Many accidents happen in food service establishments.

- Prevent falls, which is the accident that happens the most.
- Prevent cuts and burns by training the employees correctly.
- **In case of cuts, wash the cut, put on a bandage, and then wear disposable gloves.**

[Diagram: CPR]  

- It is recommended that a new food manager attend First Aid and CPR Certification classes.
- **Use the Heimlich maneuver in cases of choking, but you must be properly trained to do so.**
- Report all accidents within 24 hours to your insurance company or to your owner or general manager in writing.
- Avoid burns using the right equipment. Use only cold running water for the first degree burns.

[Diagram: Heimlich Maneuver]

**2. Fire Prevention**

Fire causes property damage. Fires can be prevented by good working habits. All employees should know how to use a fire extinguisher. **Life safety and the safety of the customers should always be the food manager's main concern.** By following a routine schedule of monitoring safety procedures and training the staff well, you will be prepared to act if the need should arise.

**TYPES OF FIRE EXTINGUISHERS**
Class A — Used for wood and paper fires
Class B — Used for grease and oil fires
Class C — Used for electric fires

Extinguishers marked ABC are required for commercial kitchens. Pay special attention to hood systems. They should be inspected according to local fire codes.

Conclusion

TRAINING
It is the responsibility of the food manager to train the food service personnel on food safety. As a food manager, you need to know that your food service establishment must meet federal, state, and local regulations and standards. Health inspectors have specific criteria that must be satisfied. Your job is to know what is expected, to anticipate problems and to change practices whenever necessary to assure the safety of food, employees, and customers.

With good training, both time and dollars can be saved. The major causes of foodborne illnesses are procedural. In other words, the wrong method of handling the product can cause the food to be contaminated before it is served. Potentially hazardous foods held at inadequate product temperature or without refrigeration continue to be the primary problem that produces foodborne illnesses. To achieve the goal of having a well-trained staff these ingredients have to be present:

❖ Knowledge of basic food safety
❖ Motivation to do the right thing at the right time
❖ Workplace where good policies are expected

REMEMBER
❖ Motivating employees to learn requires the trainer to understand the needs of the employees
❖ Motivation to learn is critical. Employees need to feel they will benefit from the training.
❖ Employees retain concepts relevant to them or their jobs.
❖ Employees learn best by active participation in the learning process.
❖ Employees learn in different ways and at different speeds.
❖ Reinforce learning by praising and giving rewards.
❖ Keep training sessions short 30 to 45 minutes.
❖ Recognize when someone does a good job.

FEDERAL REGULATORY AGENCIES:

FDA — Food and Drug Administration
USDA — US Department of Agriculture
CDC — Centers for Disease Control & Prevention
EPA — Environmental Protection Agency
NMFS — National Marine Fisheries Service
OSHA — Occupational Safety and Health Act

The manager or food manager, who is ultimately the person responsible, must be ready for inspections at all times. The purpose of inspections is to help maintain a safe and sanitary establishment. When the inspector arrives, the manager must assist as much as possible. Make sure you correct violations immediately.

When a foodborne illness outbreak occurs, you must stop serving food and call the Health Department. Do not throw away any food, since samples will have to be provided to the Health Department.

Only with an education on food safety, will it be possible to bring down the high number of foodborne illnesses and deaths related to contaminated foods in the United States.
1. Foodborne outbreak: is an incident in which 2 or more people experience a similar illness after eating a common food.

2. High-risk population: a) pregnant/lactating women b) infants c) elderly d) people with impaired immune systems

3. Sources of contamination:
   - Food handler: personal hygiene
   - Water: must use potable water except A/C and fire-fighting
   - Ingredients: must be from approved/reputable sources
   - Pests: limit access, work with professionals
   - Packaging materials: deny swollen cans, lost boxes, expired stock, damaged
   - Surfaces: must be cleaned/sanitized; cross-contamination
   - Air: keep foods covered in cooler
   - Soil: must rinse your foods well

4. 2 types of Foodborne Illness:
   - Infection: caused by eating foods disease-causing microbes
   - Intoxication: caused by eating foods that contains the TOXINS produced by microbes

5. 4 categories of food contamination:
   - Biological: bacteria, viruses, parasites, fungi
   - Chemical: food additives/preservatives (MSG, sulfites), pesticides, toxic metals, cleaning supplies
   - Physical: broken glass, metal, debris
   - Cross contamination: contaminants in one food infecting another

6. Seafood Toxins:
   - Red tide: toxic algae
   - Ciguatera: predatory tropical fish (eg. snapper, barracuda)
   - Scombroid Poisoning: time/temperature abused, histamine toxins (e.g. tuna, mahi-mahi)

7. Molds:
   - Can grow in refrigerator (below 41F)
   - Afatoxins (peanuts)
   - Kill molds at 140F for 10 minutes

8. FAT TOM
   - Foods in high protein content
   - Acidity (pH 4.6-7.5)
   - Temp (41F-135F)
   - Time
   - Oxygen
   - Moisture (water activity great than 0.85)

9. Chemical contamination:
   - Toxic metals should never be mixed with acidic foods
   - Toxic metals: copper, brass, tin, galvanized metals
   - Man-made chemicals: cleaning supplies, food additives, pesticides
   - MSDS: Materials safety data sheet

10. Allergies:
    - Anaphylaxis: shock, hives, even death
    - Dairy, peanuts, soy, wheat, seafood, shellfish

11. Danger zone:
    - 41F-135F
    - Super Danger zone: 70F-120F (Experior); 70F-125F (Servsafe)
    - Cook foods to required temp within 2 hours
    - Reheat foods to 165F within 2 hours
    - Reheat foods only once before discard

12. Thermometers:
    - Cannot be made of mercury or glass
    - Calibration by heat (212F) or cold (32F)

13. Hygiene:
    - Wash hands for 20 sec/restroom 40 sec
    - Wash stations: Prep/warewashing/service/restrooms
    - Gloves must be changed at least every 4 hours
    - Gloves do not replace washing hands

14. Outbreak:
    - Hepatitis A/E.Coli/Shigella/Salmonella
    - Must leave premise, must be reported to health dept., need doctor's authorization to return

15. FIFO
    - First in, First out: rotate stock

16. Thawing Foods:
    - Refrigeration, running water, cooking step, microwave

17. Cooling Foods:
    - 2-stage: 135F to 70F in 2 hours/70F to 41F in 4 hours
    - Break or cut into smaller pieces
    - Shallow pans of 4" deep or less

18. HACCP: Hazard Analysis Critical Control Point
    - Prevention: time and temperature
    - Required when: cure/smoke food, additives, live shellfish, juice

19. Warewashing:
    - Wash, Rinse, Sanitize, air dry
    - Chlorine (50ppm), Iodine (12.5ppm), Quat (200ppm)

20. Equipment distances:
    - Table (4 inches)
    - Floor (8 inches)

21. Cutting boards:
    - Made of either hard wood or plastic

22. Equipment Approval:
    - NSF and UL

23. Cross Connection
    - Never want to mix potable and non-potable water
    - Air gap: at least 1 inch or 2 times diameter of inlet
## Microbiology

<table>
<thead>
<tr>
<th><strong>BACTERIA</strong></th>
<th><strong>COMMON SOURCE</strong></th>
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<tbody>
<tr>
<td>Bacillus Cereus</td>
<td>rice, starchy foods, meat, soil, dust&lt;br&gt;→ vomiting (starchy) &amp; diarrhea (meat)</td>
</tr>
<tr>
<td>(Clostridium) botulinum</td>
<td>swollen cans, vacuum packed food, soil&lt;br&gt;→ botulism - most deadly foodborne illness</td>
</tr>
<tr>
<td>Clostridium perfringens</td>
<td>soil, meat products, anaerobic (like botulism)&lt;br&gt;→ abdominal pain, nausea, mild flu-like symptoms</td>
</tr>
<tr>
<td>Campylobacter</td>
<td>dirty vegetables, raw poultry, (diarrhea common)&lt;br&gt;→ one of most common bacteria for foodborne illness</td>
</tr>
<tr>
<td>E. Coli 0157:H7</td>
<td>ground beef, lettuce/ Hemorrhagic Collitis&lt;br&gt;→ (155F) fecal contaminant, from animals and humans</td>
</tr>
<tr>
<td>Listeriosis</td>
<td>lunch and dell meats, soil, unpasteurized milk&lt;br&gt;→ refrigerators; known to cause stillbirths if infected</td>
</tr>
<tr>
<td>Salmonella</td>
<td>poultry and eggs, human intestinal tract, dairy&lt;br&gt;165F&lt;br&gt;→ causes cramps, vomiting, fever</td>
</tr>
<tr>
<td>Shigella</td>
<td>fecal contamination, human Intestinal tract&lt;br&gt;→ severe diarrhea, transmitted by cross contamination</td>
</tr>
<tr>
<td>Staphylococcous Aureus</td>
<td>human skin (nose, mouth) infected cuts/burns&lt;br&gt;→ unwashed bare hands, cross contamination</td>
</tr>
<tr>
<td>Vibrio/Cholera</td>
<td>contaminated seafoods, raw/partially cooked oysters&lt;br&gt;→ high-risk population caution, buy from approved suppliers</td>
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<thead>
<tr>
<th><strong>Viruses</strong></th>
<th><strong>COMMON SOURCE</strong></th>
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<tbody>
<tr>
<td>Hepatitis A, Norwalk Virus, Norovirus</td>
<td>Poor personal hygiene, human intestinal tract; feces-contaminated water, raw shellfish, shell stock tags must be kept for 90 days</td>
</tr>
<tr>
<td>Parasites</td>
<td></td>
</tr>
<tr>
<td>Trichinella</td>
<td>Pork, wild game, 145F</td>
</tr>
<tr>
<td>Anisakis</td>
<td>Fish, sushi, -4F for 7 days</td>
</tr>
<tr>
<td>Giardia</td>
<td>Intestinal tract/contaminated water</td>
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