This book, in combination with an AFSI class, will help you learn more about the causes of foodborne diseases and how to prevent them. The goals of the AFSI food safety certification courses and website are:

To prepare you for the successful completion of a nationally-recognized food safety manager certification exam;

To plan and implement a HACCP based food safety program at your establishment (or better understand existing food safety programs at your organization);

To prepare you to provide food safety training to food handlers at your establishment;

To conduct good management practices (such as hand checks at the start of each shift);

To provide you with low-cost (but priceless) resources to help you get the information you need to keep your food safety programs up-to-date.

Even the most experienced food service managers need to check for changes in health regulations and scientific information on a regular basis. Read this book, including the study notes and then take the practice exam. Through this quick “evaluation” of your food safety knowledge and with an honest assessment your study skills, you can get a good idea of how much self study you will need. If you have not taken a management level food safety course before or if it has been more than 5 years since your last food safety course, plan on reading this book twice and take notes of unfamiliar material during your second reading. Review your notes the evening before or on the morning of your AFSI class.
Foodborne illness kills approximately 11,500 Americans each year. The people at the highest risk for death are infants, children, seniors, pregnant women and those with existing health problems (immuno-compromised). In addition, over 70 million people in the U.S. each year suffer from foodborne illness. In addition to suffering, foodborne disease also causes significant economic damages. Thousands of food service businesses are closed or lose profits from foodborne illness outbreaks. Lawsuits related to foodborne illness are an ever increasing risk for anyone that produces or serves food. Compensatory damages are awarded for medical bills and actual financial losses. Punitive damages are awarded to “punish” defendants for negligence. Food safety training and certification are the foundation for safe food handling practices that help reduce risk/liabilities and create goodwill. An establishment that has certified managers, trained food handlers and follows a HACCP-based food safety system may qualify for insurance discounts and take advantage of the “ reasonable care” defense if it is sued for foodborne illness injuries.

The most frequently cited factors in foodborne illness outbreaks include: failure to maintain adequate time and temperature controls, infected employees who practice poor personal hygiene, raw and/or contaminated ingredients that come into contact with foods that receive no further cooking (cross-contamination) and foods prepared in advance of serving that are not properly protected.

Different state and local laws can use different names for a Certified Food Safety Manager. For example, the FDA uses “Person In Charge”, Los Angeles County uses “Certified Food Handler” and Connecticut uses “Qualified Food Operator”. The certification exams and courses are based on the FDA Food Code. Local food codes may vary slightly from the FDA Food Code. The exams required “as part of a certification program” are regulated by the Conference for Food Protection (CFP) that works with the FDA. There are 3 CFP recognized exams that are equal under law: the National Registry of Food Safety Professionals, NRA ServSafe and Thompson Prometric (formerly Experior/NAI). All CFP exams/certifications are valid for a maximum of 5 years. Some state and local jurisdictions, such as the State of California require recertification every 3 years. CFP exams are proctored and are not on the internet.

According to Section 2 of the FDA Food Code, a Person In Charge/Certified Manager shall be present during all hours of operation. The Person In Charge “shall demonstrate to the regulatory authority knowledge of foodborne disease prevention application of HACCP principles and the requirements of this (food) Code.” A Person in Charge accomplishes this by having “no violations of CRITICAL ITEMS ...” and by becoming certified (Sections 2-102.11 & 2-102.20). A Person In Charge is expressly responsible for most aspects of food safety within an establishment. For example, the FDA Food Code states that a Person In Charge “shall ensure that ... EMPLOYEES are properly trained in food safety…” and supervise (“oversight” and “monitoring”) of employees. It is the law that a Person In Charge must understand HACCP principles and apply these principles in their establishments. The American Food Safety Institute (AFSI) courses help you by providing many simple and cost-effective ways to help you set up a HACCP based system.

HACCP stands for the Hazard Analysis Critical Control Point food safety system. A HACCP system is a safety risk-management system. Standard Sanitary Operating Procedures (SSOPs/cleaning programs) and food safety training programs for food handlers and managers are prerequisites for establishing a HACCP system. There are 7 parts or “steps” to a HACCP program:

#1 Hazard Analysis- Identify reasonably likely and significant food hazards, by evaluating current best science, regulations, foods, place, people, equipment and procedures that are used. This evaluation is usually conducted by a trained team including senior management.

#2 Identify the Critical Control Points (CCPs)-Based on the evaluation of food hazards, Critical Control Points are established that prevent, eliminate and/or control reasonably likely and significant foodborne hazards. In general, CCPs relate to: time and/temperature, foodhandler health/hygiene, cross-contamination and sanitizing. HACCP for food processors is different that HACCP for retail food service, but HACCP principles can and must be applied to any food service establishment.

#3 Establish Critical Limits- Set a measurable limit or value for each CCP. An example of a CCP is cooking hamburgers to at least 155° F for 15 seconds. “Target” or “Operating” limits should be set beyond Critical Limits so that foods will be safe despite small errors.

#4 Monitor Critical Limits- A common example is to use a thermometer the check the temperature of a food, then documenting this on a log. These should be “built-in” or automated whenever possible to reduce labor costs and human error. This step must identify the maintenance of food safety controls: what, how, when and who.
Courses.

Incorporate HACCP principles into your food service operation is a primary learning objective of AFSI management level food safety training. Audits and reviews of records, scientific and regulatory standards. At a minimum, verification must be conducted annually or whenever there are significant changes to foods, processes, procedures, standards or personnel. How to incorporate HACCP principles into your food service operation is a primary learning objective of AFSI management level food safety courses.

Sanitary means that a surface is free from harmful levels of microorganisms and contaminants. You cannot see, smell or taste harmful contaminants in food. All food contact surfaces must be washed, rinsed and then sanitized when changing foods, after 4 hours of continuous use or anytime they may become unsanitary. Sanitized surfaces must air-dry to allow sanitizers time to finish sanitizing. Safe (potable) water must be used for all cleaning and food service must stop if safe water becomes unavailable.

For manual warewashing in a 3 bay sink: wash hot > 110 ° F, rinse hot, use fresh sanitizer at 75 ° F. Use test strips and measure sinks and chemicals to make sure that sanitizer is at or above the minimum concentrations: Quaternary Ammonium (Quats) 220 ppm, Chlorine 50 ppm (In CA, minimum is 100 ppm). Remember that wiping cloths must be rinsed clean after each use and kept in clean, fresh sanitizer. Do NOT use sponges or thick cloths on food contact surfaces. Hot water entering dishwashing machines must be ≥180 ° F and <194 ° F.

There are biological, chemical, and physical hazards to food. Of the 3 hazard categories, biological hazards cause the greatest number of foodborne illness outbreaks and pose the greatest risk to foodservice management. Chemical hazards include cleaning solutions, pesticides, some metals, and even excessive amounts of certain food additives. Copper, brass or galvanized metals should be avoided, as they react with acidic foods (pH below 7) such as citrus fruits. Physical hazards are objects that enter food, such as glass, metal & bone.

Biological hazards include harmful bacteria, viruses, parasites, fungi (molds and yeasts), and natural toxins. Some bacteria and fungi may produce seed-like structures called spores. Many spores can survive cooking temperatures, freezing and may resist some sanitizing solutions. Some bacteria make toxins (wastes), which cannot be destroyed by cooking or other so-called remedies. You cannot “fix” contaminated food, so “when in doubt, throw foods out”. In general, heat kills living microorganisms while cold slows their growth. Exception: Parasites can be killed by blast freezing, at -31 ° F for 15 hours. This process is used for some raw seafood.

To growth and reproduce rapidly, bacteria need a number of conditions known as F.A.T.T.O.M., which stands for Food (Potentially Hazardous Foods), Acidity (most bacteria need a pH of > 4.6 for growth), Time (4 hours), Temperature (most bacteria grow best in the temperature danger zone which is 41 ° F to 135 ° F), Oxygen (Botulism can occur in a low-oxygen environment), and Moisture (bacteria need water activity of at least 0.85) – keep dry foods dry!

While any food can be a vehicle for foodborne illness, it is generally high-protein foods-classified as Potentially Hazardous Foods-that are responsible for most foodborne illness. Potentially hazardous foods are capable of supporting rapid and progressive growth of disease-carrying microorganisms, except viruses. Potentially Hazardous Foods (PHFs) include any food that consists in whole or in part of milk, milk products, shell eggs, meats, poultry, fish, shellfish, edible crustacea (shrimp, lobster, crab, etc.), baked or boiled potatoes, tofu or other soy-protein foods, plant foods that have been heat treated (such as beans or rice), sliced melons, garlic and oil mixtures, raw seeds and sprouts. Pasteurized products, even ultra pasteurized are potentially hazardous unless they are also in an aseptic package.

The FDA and some health departments now designate Potentially Hazardous Foods (PHF) as Time/temperature Control for Safety-TCS.

Potentially Hazardous Foods (PHFs) must not be in the danger zone 41 ° F to 135 ° F for more than a total of 4 hours. The exposure time adds up with each stage of handling and serving. It starts with receiving and storing, and continues through preparation, thawing, holding, serving, cooling and reheating. AFSI recommends that all foods are cooked to 180° for simplicity and safety. Times and temperatures are usually HACCP Critical Control Points (CCPs). The following are the FDA minimum temperatures (for at least 15 seconds) and are HACCP Critical Limits. Poultry, stuffed meats and stuffed pastas: 165 ° F. Ground beef and ground meats: 155 ° F. Most other potentially hazardous foods (including fish, pork, and single eggs): 145 ° F. Fruits and vegetables: 135 ° F. All PHF’s must be cooked to a minimum of 165 ° F when using a microwave and must be rotated or stirred during cooking and stand ≥ 2 minutes. Reheat previously cooked foods to at least 165° F. Exception: Rare roast beef can be cooked at 130 ° F for 2 hours.
Cooling is another HACCP CCP. Foods must be cooled quickly. Place hot foods in open shallow pans on the top shelf in the refrigerator. Adding ice to the food, using a cooling paddle or ice water baths in sanitary containers are other approved methods. The FDA Food Code allows a “2 stage” cooling method for certain foods, where hot food is cooled to 70 °F within 2 hours and 41 °F within 4 hours. AFSI recommends foods are cooled within 2 hours.

There are 2 basic types of foodborne illness: infections and intoxications. **Infections** occur when a living biological hazard is consumed. **Intoxications** occur when bacteria or molds produce waste (micro-poop) that can be toxic substances that you cannot see, smell or taste.

**Examples of common foodborne infections:**

**Salmonellosis:** Bacterial infection. Salmonella is found in animals especially poultry, eggs, in pets, and in humans. When preparing products containing eggs that will not be thoroughly cooked, such as hollandaise sauces, Caesar salad dressings, meringues, and mousses, use liquid pasteurized eggs, especially when serving Highly Susceptible Populations (HSP). Do not serve undercooked shell eggs.

**Listeriosis:** Bacterial infection. Raw soil-grown vegetables can be contaminated. Deli and unpasteurized dairy products, certain soft cheeses, raw meats, and poultry have been implicated in outbreaks of Listeriosis. Fetal deaths have been caused by this disease. Most PHF/TCS foods must be cooked or consumed within 7 days as *L. monocytogenes* is found in many refrigeration units and can grow <41 ° F. Listeria can also be found in drains and cool moist areas where molds are present.

**Escherichia coli 0157:H7:** Bacterial infection. Raw or undercooked ground meats, unpasteurized juices and sprouts are vehicles of transmission. Cook ground meats thoroughly to a minimum internal temperature of 155 ° F for at least 15 seconds. This pathogen kills hundreds of children in the USA each year. E. coli can also be transmitted by carriers-people or animals that show no signs of illness.

**Vibrio (sp):** Bacterial infection found in contaminated or time/temperature abused seafoods.

**Examples of common foodborne intoxications:**

**Staphylococcus aureus:** Intoxication. Staphylococcus is most commonly found in the nasal passages, saliva, on hands and skin and in cuts, burns and boils. Good personal hygiene (including waterproof bandages) and temperature controls can prevent “Staph”.

**Clostridium botulinum:** Intoxication. Spores are virtually everywhere, but can grow only in a low oxygen, mild pH environment. Throw out or return any swollen cans and any vacuum packed foods (a/k/a MAP, ROP) that do not appear normal have been temperature abused.

**Bacillus cereus:** Intoxication. Spores (micro seeds) are found in soil and dust, so this pathogen can effect many foods.

Viruses do NOT grow on foods. **Hepatitis A** causes a severe, highly contagious viral infection. It can make someone extremely ill for months. A person can be a carrier (show no symptoms) for up to 50 days. Hand washing helps, but vaccination is the only completely reliable control measure for Hepatitis A. All viruses, including the common Norovirus (formerly Norwalk viruses) and Rotaviruses are spread from the human intestines, by foodhandlers that do not wash their hands after using the toilet, contaminated water and improperly handled ice. Good hand washing and sanitary practices are essential to prevent viruses. AIDS (HIV) is not a foodborne illnesses.

Parasites also need to live on or inside a host to survive. **Trichinella spiralis** is the best known parasite that contaminates pork and game meats. **Anisakis** is one of many fish parasites. Parasites can be destroyed by cooking to 145 ° F or blast freezing at -31 ° F for 15 hours.

**Fungi:** Mushrooms, molds or yeasts can produce toxins that can cause allergic reactions and liver disease. Over time, they can grow in almost any environment. Keep foods fresh – practice F.I.F.O. (First In First Out) and discard any foods that do not appear normal.

The most important aspect of person hygiene is frequent and thorough hand washing. Friction is essential for removing germs. Wash hands well for at least 20 seconds. Wash hands often, after touching anything that is not sanitary. Bare hand contact with food must be avoided. Gloves do not substitute for hand washing. Build-in safe handling procedures, such using serv-a-wax papers. Instruct employees to wash their arms “up to the elbows” to ensure that their lower arms and wrists are clean. Do not wear aprons in the bathrooms. Wounds on the hands must be covered with water-proof bandages and waterproof, single-use, plastic gloves. Employees may need to move to a non foodhandling job until an injury heals or if they show symptoms of mild illness. If an employee has been exposed or diagnosed to Norovirus, *E. coli* (enterohemorrhagic), Hepatitis A, Shigella or Salmonella typhi or shows symptoms of these diseases, that employee must be excluded from the establishment and return to work after obtaining written permission from a state-licensed health practitioner. Employee health forms (FDA) are available at no charge from AFSI and FDA websites.
Receiving is another HACCP CCP. Check the temperatures of PHFs by holding thermometer tightly between two packages being careful not to puncture or break wrapping. Document the temperature on the delivery receipt (along with your signature, date and time). Fresh Potentially Hazardous Foods must be cooked or consumed within 7 days or used within manufacturer for use by date. Accept deliveries of fresh oysters and other shellfish only with a State shell stock tag that shows the dealer and harvest date. Keep these tags for 90+ days.

Dry storage should be cool (50 ° F) and dry (relative humidity of 50-60%). Shelves must be slatted and at least 6 inches above the floor. Overhead pipes can contaminate food through condensation or leaks. Gutters should be placed under pipes. All food contact/prep surfaces must be easy to clean: accessible, adequate lighting and non-reactive. Waste liquids are a serious threat and must be managed properly. Dumpsters must have a leak proof design and be placed on concrete or other sealed surface. Cross connections that could allow sewage to contaminate potable (safe) water must be prevented by using air gaps at faucets and drains and back flow prevention devices on hoses.

IPM – Integrated Pest Management is a system that combines preventive tactics with control measures to reduce pest infestation. The Good sanitation is always the best way to prevent pests. Build out pests by sealing any openings. Glue “boards” should be used to monitor pests. Pesticides should be a last resort and should only be applied by a licensed and experienced PCO (Pest Control Operator).

Prevent Cross-Contamination: Separate and segregate raw animal foods by using color coded cutting boards, sanitary food contact surfaces, practice good hygiene and separate areas for preparation. In a refrigerator, raw animal foods must be segregated-stored below cooked or RTE (Ready-To-Eat) foods. Make and post signs such as “Raw animal foods must be stored on bottom shelf / below cooked foods, RTEs and fruits and vegetables”. Also make sure that any unsafe foods/containers that are being returned for credit are “tagged”-separated from safe foods and equipment and are clearly marked with signs such as “do not use-for return only.”

A “Major food allergen” includes: Milk, eggs, fish, shellfish, tree nuts (almonds, pecans, walnuts), wheat, peanuts, and soybeans or a food ingredient that contains protein derived from a major food allergen. For more allergen information, visit the Food Allergy Network at www.foodallergy.org. These study notes provide summarized information to help students become familiar with some of the key elements of the AFSI Food Safety for Food Service Managers Certification course. These notes are not a substitute for a course of study.

Section Three: Foodborne Illness & Food Safety Manager Certification

Foodborne illness kills approximately 11,500 Americans each year. The people at the highest risk for death are infants, children, seniors, pregnant women and those with existing health problems (immuno-compromised). In addition, over 80 million people in the U.S. each year become ill due to contaminated or mishandled foods.

In addition to human suffering, foodborne illness also causes significant economic damages. Regardless of the size of your establishment, an outbreak of foodborne illness is a serious matter. Customers may be driven away by the bad publicity. The establishment’s reputation may be damaged for a long time. Each year, thousands of food service businesses are closed or lose profits from foodborne illness outbreaks. Lawsuits related to foodborne illness are an ever increasing risk for individuals and organizations that produce, process, prepare, sell or serve food. Courts award compensatory damages to anyone made ill by the food including medical bills, lost wages, and other actual expenses. Often, punitive damages are also awarded as “punishment” to food service business owners and managers for negligence.

The Centers for Disease Control and Prevention (CDC) have consistently stated the majority of reported foodborne outbreaks were caused by the mishandling of food within the retail segment of the industry (restaurants, markets, churches, camps, institutions and vending locations) where food is prepared and provided to the public.

The International Association for Food Protection defines a foodborne outbreak as an incident in which two or more persons have the same foodborne disease, exhibit similar symptoms, have the same pathogens (disease causing microorganisms and/or their toxins); and foods or other common factors.
The most frequently cited factors in foodborne illness outbreaks include: failure to maintain adequate time and temperature controls, infected employees who practice poor personal hygiene, raw and/or contaminated ingredients that come into contact with foods that receive no further cooking (cross-contamination) and foods prepared in advance of serving that are not properly handled.

Today, food safety risks are effectively managed using principles of the Hazard Analysis Critical Control Point or HACCP system. A HACCP system prevents controls or eliminates reasonably likely and significant biological, chemical and/or physical food hazards. By starting and maintaining a HACCP-based food safety system, you can avoid the high costs of foodborne illness outbreaks and gain many other significant advantages. The experience of top food service managers and published studies prove that well-managed HACCP systems can and do increase profits. Customers are impressed with cleanliness and enhanced quality of food, adding to the valuable reputation of an establishment. Foodhandlers that understand how their tasks prevent foodborne illness take enhanced pride in their work and stay employed at an establishment longer. HACCP food safety systems can even reduce the costs of food waste and spoilage.

Food safety training and certification are the foundation for HACCP systems and good practices that reduce liabilities and create goodwill. An establishment that has certified managers, trained foodhandlers and follows HACCP-based food safety system may qualify for insurance discounts and be able to take advantage of a “reasonable care” defense in the event of legal action against them.

Section Four: Biological, Physical, & Chemical Hazards

Biological Hazards
Most biological hazards are disease-causing organisms that require a microscope to be seen. These microorganisms are also known as pathogens. Some biological hazards are naturally-occurring toxins, such as poisonous plants and fish. Pathogens include bacteria, viruses, parasites and fungi. Most pathogens cause illness through infection, when a living, harmful microorganism is ingested. Other pathogens cause illness through intoxication, when a poison produced by a pathogen is ingested. Some natural toxins are also classified as biological hazards. Over the past 50 years, “factory” farming, high-volume food processing, global transportation and other changes in food production has resulted in an overall increase of pathogens in our food supply. Today we are faced with pathogens that were not present in foods generations ago. If a food service manager is not using up-to-date food safety controls, they are placing their health, the health of others and their business at risk.

Bacteria
Bacteria are single-celled organisms and are usually the greatest concern to food safety managers. Bacteria are living creatures and they are virtually everywhere. The average person has more bacterial cells in their bodies than body cells. While many types of bacteria are beneficial, some cause illness. Since we cannot see, smell, or taste bacteria in food, we do not know if the bacteria in food is pathogenic or beneficial. This is why mishandled food may not always cause foodborne illness. Bacteria are competitive and at times “good” bacteria may prevent foodborne illness by limiting the number of “bad” bacteria. However, a number of recent scientific studies indicate that some pathogenic bacteria have become stronger and are more prevalent. Today, beneficial bacteria are often less able to compete with pathogenic bacteria. With these new “super germs” resisting some natural barriers, man-made controls are more important than ever.

You’ve probably heard the saying “out of sight, out of mind”. In food service, we must control the bacteria (and other biological hazards) that cannot be seen by relying on good food safety practices and procedures at all times. Bacteria, like other living organisms need mild temperatures, food and water. They also make excrete wastes. Some bacteria wastes are toxins that cannot be destroyed by cooking. Bacteria reproduce when a cell divides itself. Under the favorable conditions, they literally double in a clone-like manner, approximately every 20 minutes. Some bacteria can multiply from a small, relatively safe amount to dangerous levels in hours.

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Most bacteria cause illness by infections. Approximately 30% of foodborne illness caused by bacteria are intoxications, caused by poisonous bacterial wastes. Food handling procedures such as cooking will not adequately destroy bacteria (or mold) toxins, so it is impossible to “fix” contaminated food. When in doubt, throw it out!

Some bacteria produce spores, a reproductive structure often called “micro-seeds”. They can survive cooking, freezing, and inadequate sanitizing solutions. If time, temperature and/or other environmental conditions are not controlled, the bacterial spores “grow” into bacteria. This is why temperature controls are important for cooked and raw foods. It is obvious that cooking kills bacteria. Some uninformed people believe that cooked foods can remain free from harmful levels of bacteria, if that food is “protected” from another source of bacteria. In fact, spores from the “dead” bacteria can begin to “grow” as soon as food cools and begin to multiply.

Serious bacterial diseases can cause disability or death. Food service managers must be familiar with some of these major pathogens such as those in the AFSI study notes. Also, please refer to Table 1, common foodborne diseases caused by bacteria, in the reference section. This table illustrates symptoms, duration, typical foods implicated, mode of contamination, and prevention measures.

**Environmental Factors for Bacterial Growth – F.A.T.T.O.M.**

In general, bacteria thrive in potentially hazardous foods, which are often moist, protein-rich and chemically neutral or low in acid. These conditions can be remembered by the acronym FAT-TOM:

**Food** – High-protein (potentially hazardous) foods are likely to enter the food service operation carrying bacteria or may be easily contaminated once there.

**Potentially Hazardous Foods** (PHF)– any foods (in whole or part) capable of supporting the rapid and progressive growth of infectious or toxigenic microorganisms. Potentially hazardous foods include: Milk or milk products (even when pasteurized), shell eggs, meats, poultry, fish, shellfish, edible crustacean (shrimp, lobster, crab), baked or boiled potatoes, tofu or other soy-protein foods, plant foods that have been heat treated (such as beans or rice), raw seeds and sprouts, sliced melons, garlic and oil mixtures that have not been modified to prevent the growth of pathogens. Potentially hazardous foods are also known as TCS – Time/temperature Control for Safety foods.

**Acidity** – Acidity is measured on a scale from 0 (acidic) to 14 (alkaline). A solution with a pH (acid-alkaline measurement) of 7.0 is neutral. Potentially hazardous foods have a pH range between 4.6 and 10. Most bacteria will not grow well at pH levels below 4.6. While rare, acidic foods, can allow growth of acid resistant bacteria, such as E. coli 0157H:7. Adding vinegar, lemon juice, mayonnaise or other acidic food to a recipe may help slow bacterial growth. Acid should not be used as the only control measure without scientific testing, monitoring with calibrated pH meters and approval from health authorities.

**Time & Temperature** – Potentially hazardous foods cannot remain in the temperature danger zone (41° F-135 ° F) for more than a total of 4 hours during the entire food handling process. Since bacteria can multiply at lower temperatures, refrigeration is not absolute protection. In general, fresh potentially hazardous foods, except foods with a manufacturer’s expiration date must be cooked or consumed within 7 days.

**Oxygen** – Some bacteria require oxygen to grow, while others require an oxygen-free environment (anaerobic). However, most bacteria that cause foodborne illness can grow either with or without oxygen (facultative).
Moisture – The availability of water in food is expressed as water activity (Aw). The Aw of water is 1.0. The lowest Aw at which most bacterial pathogens will grow is 0.85. Water activity can be reduced to safer levels by dehydrating, adding sugar or salt, or cooking. Dry foods, such as soup bases, dried eggs and milk, dried soup mixes, beans, pasta, and rice become potentially hazardous when water is added, so keep dry foods dry!

Cross-Contamination
Cross-contamination is the transfer of harmful microorganisms from raw foods to ready-to-eat foods or foods that receive no further cooking. Contact with unsanitary surfaces, such as hands, sponges, cleaning cloths, cutting boards, utensils, and equipment are common means of cross-contamination.

To prevent cross-contamination, follow these control procedures:

- Do not touch raw foods and then touch cooked or ready-to-eat foods without washing your hands.
- Be sure to wash, rinse, and sanitize utensils, equipment and food-contact surfaces including: cutting boards and knives after each use and/or after 4 hours of continuous use.
- Use separate, color-coded cutting boards for raw animal foods.
- Clean thin cloths between each cleaning activity and keep them in fresh sanitizer. Clean, disposable paper towels are highly recommended. Do not use sponges or thick cloths on food contact surfaces.
- Separate or segregate raw foods of animal origin away from foods that will not be thoroughly cooked. Store meats, fish and poultry below (on the bottom shelf) ready-to-eat foods such as salads or use a separate refrigerator for raw animal foods. Post signs to reminders on refrigeration units.

Viruses
Viruses are one of the smallest and simplest form of life known often compared to microscopic seeds. People are the primary carriers of viruses. See Table 2 in the reference section for a list of common foodborne diseases caused by viruses. Viruses contaminate food through poor hygiene by food handlers, a contaminated water supply, or shellfish harvested from sewage-contaminated waters. Viruses do not reproduce while on food and they can survive freezing. When raw, ready to eat or lightly cooked foods become contaminated with virus particles, illness often occurs. Foodborne viruses can be controlled by excellent hygiene, through cooking, good sanitation and adequate plumbing. Hepatitis A, which causes inflammation of the liver, can be prevented by vaccination. AIDS (HIV) and Hepatitis B, C and D are NOT foodborne diseases.

Parasites
Parasites are small or microscopic creatures that need a host (supporting organism) to survive. One of the best known parasites is Trichinella spiralis, a roundworm found in pigs and certain other animals. If not killed by careful cooking to proper internal temperatures, its larvae can cause Trichinosis, a disease which causes painful muscular symptoms. There are over 600 seafood parasites, including Anisakis. People who eat raw, marinated, or partially cooked seafood may be at risk from parasites unless these are blast frozen (-31° F for 15 hours) for parasite destruction. Pork, game animals and fish must be prepared with care to avoid cross contamination as parasites from these foods can infect other foods that will not be cooked above 145° F. Table 3 in the reference section lists the major foodborne diseases caused by parasites, including some parasites transmitted through water.
Fungi
Fungi are molds, yeasts, and mushrooms. Since poisonous and non-poisonous mushrooms often look alike, do not use any mushrooms that are not purchased from a reliable and approved source. Fungi and their spores (micro-seeds) are found in the air, soil, and water. Molds may be observed as fuzzy, colorful growths on food. With time, molds cause spoilage, but some molds also produce toxins that can cause illness, infections, and allergic reactions. If mold is not a natural part of the food (such as bleu cheese), the food must be discarded. Mold can be killed by heat (10+ minutes >140° F), but this will not destroy mold toxins. Yeasts are often found in moist foods with a significant sugar content. Yeasts often spoil jellies, jams, honey. Yeast contamination can appear as bubbles, an alcoholic smell or taste, pink discoloration or slime. As fungi will grow in almost any condition with enough time, it is important to practice proper stock rotation, commonly known as F.I.F.O.- First In, First Out.

Plant toxins
Uncooked/undercooked fava beans, rhubarb leaves, jimson weed, and water hemlock have been cited in foodborne illness outbreaks. Cooking and freezing do not inactivate most plant toxins.

Seafood toxins
The best food safety controls for seafood are to purchase it only from a reputable and certified wholesaler, carefully examine incoming seafood, and select low risk fish for your menu. Puffer fish, blowfish, moray eels and freshwater minnows contain natural toxins. Certain species of group, barracuda, snapper, and tropical reef finfish may eat smaller fish that have eaten algae carrying ciguatoxin. Ciguatera results from ingestion of fish with elevated levels of this toxin, characterized by vomiting, nausea, dizziness, and other symptoms. Ciguatoxin can be fatal and is not destroyed by cooking, freezing or other procedures.

Some larger fin fish such as mahi mahi, tuna, bluefish, and mackerel that have been time-temperature abused may cause scombroid intoxication (from histamine poisoning). Symptoms include flushing and sweating, nausea, abdominal cramps, and headaches. Histamine is odorless, tasteless, and not inactivated by cooking. Good seafood suppliers will test fish for histamines. Testing is not a guarantee of safety, but it should be conducted to reduce the risk. Table 4 in the reference section provides a list of common foodborne diseases caused by seafood toxins, as well as symptoms, onset, typical foods implicated, mode of contamination, and prevention methods. Unless you have considerable seafood expertise, AFSI recommends that you obtain a copy of the FDA Seafood Hazards and Controls Guide, a reference book that can be ordered from the FDA website - www.cfsan.fda.gov

Chemical hazards
Chemical hazards include certain food additives and preservatives, toxic metals (copper, brass, zinc/galvanized) in cookware and equipment, toxic plastics (trash bags, bins) and cleaning chemicals.

Pesticides
To protect food from pesticide contamination, control measures include:
- Washing all fruits and vegetables during food preparation.
- Allowing only a licensed pest control operator to apply pesticides on your premises.

Additives and preservatives
Only approved preservatives and additives should be used. They should be used only according to manufacturers’ instructions and never used to cover up spoilage. Sulfiting agents and nitrates are common preservatives. Sulfiting agents have been linked to a number of serious allergic reactions among sensitized individuals, especially asthma sufferers. Monosodium glutamate (MSG) is a common chemical additive and can cause headaches and other unpleasant reactions in some people. AFSI does not recommend the use of additives in retail food service.
**Toxic Metals**

Chemical contamination may occur when certain metals contact high-acid foods during cooking or storage. Potentially toxic metals include lead, copper, brass, zinc coating, antimony, and cadmium. Foods implicated in metal poisoning include sauerkraut, tomatoes, fruit gelatins, carbonated beverages, lemonade, and fruit punches.

Food safety controls include:
- Use metal containers and metallic items only for their intended purposes. For example, do not use refrigerator shelves, which may contain cadmium, as makeshift grills or to store unwrapped meat.
- Do not use enamelware which may chip and expose underlying metal.
- Do not use any galvanized, copper or brass (copper alloy) containers in food preparation. They react with juices, lemonade, tea, salad dressing, or any other high-acid foods.
- Do not use any lead-based products including lead-glazed ceramics in food preparation or storage areas.

Note: Some plastic containers contain chemicals than can contaminate food, such as plastic garbage cans and bags made from recycled materials. Use only microwave-safe or “food grade” plastic food containers.

**Foodservice Chemicals**

Detergents, polishes, caustics, cleaning and drying agents, and other similar products are poisonous and should never come into contact with food. Controls include:
- Follow label directions for storing and using chemicals.
- Store chemicals in their original containers. Label them with contents and hazards. Keep them in dry, locked cabinets or areas away from food, food-contact surfaces, and separate from other chemicals.
- If chemicals are transferred to smaller containers for use, each smaller container must also be labeled and stored properly, as should all gloves, funnels, and other supplies used to transfer chemicals.
- Never use food containers to store chemicals or chemical containers to store food. Empty chemical containers must be disposed of according to the manufacturer directions.
- Food handlers who use chemicals must wear appropriate gloves and thoroughly wash and dry their hands before returning to food preparation duties. Aprons and/or garments must be changed as needed.
- All workers must read any Material Safety Data Sheets (MSDS) for any chemicals used. Keep MSDS sheets accessible, as they contain first aid and other emergency instructions (OSHA requirement).

**Physical hazards**

Physical hazards include pits, bone fragments, broken glass, nails, staples, metal fragments, broken machine parts, screws, or pieces of packaging materials that accidentally enter food. Physical hazard controls include:
- Never use glasses to scoop ice. Use only commercial-grade plastic or metal scoops with handles.
- Do not store glass or any items in ice to be used for drinks (ice is a food and can transmit viruses).
- Do not store toothpicks or non-edible garnishes on shelves above food storage or preparation areas.
- Place shields on lights over food storage and preparation areas. Consider using shatter-proof light bulbs.
- Clean can openers often and replace the blade often. Dull blades can cause metal pieces to enter food.
- Remove staples, nails, or similar objects from boxes and crates when food is received so these materials do not later fall into food. Do not use staples to close food containers, as they can enter the food.
- Food handlers should not wear jewelry (except plain wedding bands), false fingernails, or false eyelashes when on the job. Aprons should have no pockets above the waist.

Biological hazards, especially bacteria and viruses, pose the greatest risks. Biological, chemical, and physical hazards can be effectively controlled with a risk-based food safety plan (HACCP) and sanitation policies. Good food safety practices that prevent, eliminate or control food hazards will protect yourself, your employees, your customers and your profits. Food safety doesn’t cost - it pays in many ways!
Section Five: Food Handler Hygiene & Health

Anyone can be a carrier of a disease. A carrier is a person who can transmit a disease, but may show no symptoms. In addition, a person can transmit pathogenic bacteria or viruses for weeks after an illness. This is one more reason why it is critical to wash hands, “keep clean” and be in good health whenever you work with food.

**Wash hands well** – hand washing is the single most important personal hygiene activity. Rub hands together for at least 20 seconds – this is essential, because the friction between your hands destroys bacteria on your hands. Be sure to scrub up to the elbows, your fingertips, between your fingers and the back of your hands. Turn off the faucets (and open the door, if necessary) with a paper towel. NEVER use a dirty nail brush! This may require your facility to have a number of nail brushes available. All nail brushes must be washed, rinsed, sanitized and air dried before use. The flat rack of a dish washing machine is ideal for cleaning nail brushes. Disposable nail brushes are an option. If a nail brush is not available, a disposable towel can be used to scrape dirt out from under your fingernails. Remember – approximately 30% of foodborne illness is caused by inadequate hand washing.

**Gloves do not replace hand-washing** – gloves can be torn easily and most may have defects which can allow harmful microorganisms from your hands to contact food. Change gloves after touching anything unsanitary. Food handlers must wash their hands when they change their gloves. Never attempt to wash gloves. Bare hand contact with ready-to-eat foods is illegal. See Selections from the 2005 FDA Food Code on the AFSI website.

**Hand sanitizers do not replace hand washing** – sanitizers only work on surfaces that are already clean. Hand sanitizers may also reduce the beneficial bacteria on your hands. If someone cannot wash their hands, the use of a moist towelette (Wet Ones, etc.) is the next best option, as the friction will remove/reduce pathogens.

**Keep your fingernails trimmed and clean** – rough fingernails can tear gloves and harbor bacteria. Do not wear false fingernails or fingernail polish, as these can accidentally enter food.

**Hand washing sinks must be used only for hand washing**
Replace soap and other supplies immediately. Hand washing sinks must provide hot water ≥ 110°F.

**Wash hands often** – wash your hands every time you touch any unsanitary surface, including:

- After using the restroom – It is recommended (and some health codes require) that after using the restroom, food workers wash their hands twice – first in the restroom and then in the hand-washing sink.
- Just before starting work.
- After eating, drinking, or smoking (to remove your saliva from your hands)
- Touching your face, body, nose, mouth, ears, eyes, hair, sneezing, coughing, or blowing your nose
- Handling garbage, dirty dishes, dirty bus tubs, trash cans, or bins
- Touching drains, disposals, mops, or other unsanitary cleaning tools
- Immediately after handling raw foods and any items (such as cutting boards) that touched raw foods
- Touching any other unsanitary item or surface which may contaminate your hands

**Cover all wounds** – Cuts, burns, sores, and even small infections on your hands can spread bacteria such as Staphylococcus aureus and viruses. A small cut or burn on your hands (or any other injury on the job) must be reported to management immediately. Wounds must be treated and protected. Minor wounds must be covered with a water-proof bandage (with finger cot if desired) and single use disposable gloves. This double barrier is essential!
How food managers can get employees to wash their hands often

“The PERSON IN CHARGE shall ensure that employees are effectively cleaning their hands...”

FDA Food Code Section 2-101 (Management and Personnel)
Under law, it is a food manager’s responsibility to make sure that food handlers are washing their hands often and well. This requires constant supervision, training, coaching, and encouragement.

1. Lead by example – employees only wash their hands as often as managers and their peers wash their hands.
2. Train all employees about foodborne hazards, so that they understand WHY washing their hands and other aspects of food safety are so important.
3. Make sure that all hand washing sinks are in good working order, are used only for hand washing, are accessible and have plenty of soap, paper towels, and other supplies by monitoring them throughout the working day.
4. “Catch people doing things right!” Praise employees when they wash their hands and do other food safety procedures correctly.
5. Consider an incentive program. The “hand washing lottery” game can be fun and effective. To set up the hand washing lottery game, managers first select weekly prizes. These prizes can be small bonuses, lottery tickets, extra vacations days, movie or baseball tickets, free meals, etc. The managers then write the prizes on small strips of paper, then fold them so that no one can read the paper strips without unfolding them. Then the managers select a different time every week when the next employee to wash his/her hands (correctly) will get to draw for one of the prizes. The drawing time must be kept secret and change every week, so that employees will never know when they might “hit the lottery” by washing their hands! Some managers simply provide “free-lunch” cards whenever an employee does an outstanding job.
6. Provide non-toxic hand lotion. If food service workers are washing their hands often, their skin may become dry. Preventing chapped hands is important. If you desire to use a hand sanitizer type hand lotion, remind employees they must never use hand sanitizers as a replacement for washing hands. Some establishments require employees to apply hand lotions whenever they go on break. AFSI recommends Aloe Vera (without additives). It is inexpensive and non-toxic.
7. Post signs reminding employees of the importance of hand washing at all hand washing sinks.

Workers cannot handle food while ill – managers must restrict to non-food handling tasks or exclude
Employees should call the manager from home if they have a fever with sore throat, jaundice, diarrhea, and/or any stomach-related illnesses. Managers must determine if the employee can work away from food (restrict) or if the employee must not report for work (exclude). Managers should always advise workers to see a doctor if symptoms are severe. Workers must advise a doctor that they work with food – no one can work in a food service or food processing while they have Hepatitis A, Shigellosis, Salmonellosis, Norovirus, or E. coli 0157:H7. See Food Employee Reporting Agreement and the Management and Personnel section from the FDA Food Code under “Selections from the 2005 FDA Food Code” section on the home page of the home page of AFSI website (www.americanfoodsafety.com) or the FDA website (www.cfsan.fda.gov). Vaccinations to prevent Hepatitis A are now available from health departments and highly recommended before traveling abroad.
Clean aprons, uniforms, clothing, jewelry & grooming
Always wear clean clothes to work. It is recommended that you change into clean clothes (such as uniforms) at work and also change your clothes immediately if they become soiled. At a minimum, a food handler must wear a clean apron (over a clean shirt) when starting work and aprons must be changed as they become dirty or every 4 hours. Aprons should be removed before leaving a food preparation area. Management must provide wall hooks to see that aprons do not leave the area. Aprons must NEVER be worn into a restroom. Jewelry should not be worn when working with food – jewelry can harbor bacteria and can accidentally fall into food creating physical hazards. You should also bathe or shower daily, preferably just before leaving for work. Your hair must be restrained with hats or hairnets whenever you work with foods.

Section Six: Using Thermometers & Recording Temperatures
Temperatures are critical controls. Cold temperatures can keep harmful bacteria from multiplying to unsafe levels. Heat can destroy harmful microorganisms. At a minimum, food safety thermometers should read from 0°F to 220°F for use in both hot and cold foods, but -40°F to 300°F is now common on electronic thermometers. Correct use of food safety thermometers is critical to monitor food temperatures and must be used continuous or “on-going” basis. Some thermometers are built into a piece of equipment, such as a refrigerator or steam table.

Every cooling and heating unit should have at least two thermometers (or like measuring devices) with bright displays or dials large enough to be seen at “arms length”, with high-contrast dials or displays at least 2” in diameter. When a second thermometer is used in each piece of equipment, it verifies the accuracy of the first thermometer and shows any temperature differences within the unit.

In addition, the internal temperatures of Potentially Hazardous Foods a/k/a Time/temperature Control for Safety (TCS) foods should be taken and recorded as often as necessary to ensure and document food safety.

Metal stemmed probe thermometers
Food safety probe thermometers must have a metal stem - glass stems or mercury-filled thermometers are prohibited. Metal stemmed probe thermometers have a sheath or sleeve and a loop type clip for holding the thermometer during use. Do not touch the thermometer stem, as hands can effect the temperature and/or cause contamination. It is important that the thermometer is washed, rinsed (cleaned) and sanitized before and after each use.

Pre-packaged alcohol towelettes or sanitary, disposable cotton balls (or “puffs”) saturated in 91% isopropyl alcohol (not rubbing alcohol) are often used for this task. Cotton balls in alcohol must be stored in Tupperware or food grade plastic away from foods or flames*. When using this method, you must make sure the cotton balls or towelettes are well-saturated in the alcohol and that the entire surface area of the thermometer stem is wiped with finger-tight pressure at least twice (the first wipe cleans, the second wipe sanitizes). Then wave the thermometer stem in the air until the alcohol evaporates (usually 15 seconds) before using the thermometer.

WARNING! – Alcohol is highly flammable! *

Never use a thermometer in/on a raw animal food or anything unsanitary without cleaning and sanitizing before another contact or use. Always leave the thermometer in the holding clip until you have finished taking temperature reading(s) and clean and sanitize the stem to avoid contaminating the clip. Never use or place a thermometer back in its sheath or sleeve until the probe and clip have been cleaned and sanitized. If you are cleaning and sanitizing a thermometer with cotton and alcohol, you must still wash, rinse, and sanitize (air dry) at the 3 compartment sink often. Never put a metal thermometer in a microwave oven.

Never use alcohol near flames or high heat sources.
**Pocket bi-metallic thermometers**

One of the most common food safety thermometers is the bi-metallic pocket thermometer with a 4 ¾” stem. It measures temperatures with an immersion area of 1 ½” at the lowest part of the stem (for use in foods at least 2” thick). The temperature is displayed on a dial at the top of the thermometer. Make sure the dial is large enough to read. As many people cannot see a 1” diameter dial with ease, AFSI recommends that all dial type thermometers be at least 2” in diameter. You should note the calibration nut at the bottom of the dial/top of the stem.

Bi-metallic stemmed thermometers are mechanical, so you need to wait about 15 seconds (or longer if necessary) until the hand on the dial stops moving to obtain an accurate reading. Pocket mechanical/bi-metallic thermometers are best when only a small number of daily readings are needed.

**Electronic thermometers**

Electronic digital display probe thermometers and thermocouples are faster to use and calibrate than mechanical thermometers. The purchase price is usually more than a mechanical thermometer, but they can save time and thereby encourage increased use. They measure temperatures through a sensor in the end of the stem (usually ¼”) and are necessary for smaller or thin foods.

The smaller immersion area provides a more precise temperature reading in a smaller area. They can be easier to read as the temperature appears in numbers on a readout display (instead of a point on a dial). There are different types, so it is important to read the manufacturer’s directions for use and calibration. AFSI recommends that all electronic thermometers also have an “auto shut-off” feature to save battery life.

**Other thermometers**

Today there are many special thermometers for different types of foods and equipment. Metal stemmed mechanical thermometers are commonly available in lengths of 12”, 18” and 24” with different size immersion areas, designed for specific tasks, such as cooling or storage. Electronic thermometers have “cabled” or “wired” probes that can check temperatures at most practical distances. With specialized thermometers, make sure that your staff is trained to use them only for the size or type of food or in the equipment for which they were designed. Infrared thermometers offer a rapid “point and shoot” style of recording surface temperatures (not internal) and can be affected by packaging, reflective surfaces, angles and distance (usually < 2’). They are accurate only when used according to the manufacturers directions.

In addition, there are single-use temperature indicators such as “T-Sticks” designed to indicate that the food has (or has not) reached a certain temperature. These can be useful for showing customers a particular food (such as a hamburger) is thoroughly cooked and for temperature records. Refrigerator/thermal storage alarm systems that can record temperatures on a computer and/or can dial telephone numbers are also worth considering.

**Maintenance of thermometers**

Just as all thermometers must be cleaned and sanitized after each use, they must be calibrated (+/- 2° F) regularly. It is recommended that all thermometers be calibrated at the beginning of each day, and immediately after they are dropped or experience periods of extreme use, such as checking very high and alternatively very low temperatures for extended periods of time. Like any device, thermometers can get damaged or wear out and need occasional replacement or repair. Train your employees to report to you immediately if they suspect that a thermometer is not working properly. Keep spare batteries for electronic thermometers on hand.
Calibration of thermometers

The ice point method of thermometer calibration is easy. Simply fill a 12 ounce Styrofoam (or similar) cup with approximately 9/10th crushed (or small cubes) ice and 1/10th water. Then, insert the sensing area of the thermometer into the ice-water slush and wait until the dial stops moving or digital display has a reading. If the thermometer is calibrated, it should read 32 °F (0 °C). Make sure that the thermometer does not touch the sides or bottom of the cup. Mechanical bi-metallic stemmed thermometers are calibrated by moving the calibration nut on the bottom of the dial with a clean pair of pliers (turn the nut until the needle reads 32 °F). If an electronic or digital thermometer/thermocouple does not read 32 °F, replace the battery, calibrate according to manufacturer’s directions or have the thermometer serviced. Boiling water can also be used for calibration with the Boiling-Point method. AFSI does not recommend this method because of the risk of injury (burns). The temperature of boiling water is not always 212° F. Factors that effect the temperature of boiling water include elevation and mineral contents.

Using thermometers-taking temperature readings

A food and its corresponding internal temperature may vary due to size and density. Overall, a temperature should be taken at the center or the thickest part of a food. When cooking the “end” or final temperature must be taken away from the heat source. Some pocket thermometers can melt inside ovens. It may be necessary to stir the food before taking temperature readings or take readings at different places in the food, such as the front, center, and back of a large roast. It is very important that the sensing area/stem of a thermometer touch only the food – not the sides or bottom of a pan or other holding, cooking, or storage vessel.

Foods cooked in microwave ovens should stand for two minutes before taking a temperature reading, as they can have “hot-spots”.

Temperatures of foods in individual packages, such as milk cartons, can be taken by placing the immersion area of a probe between two cartons. Opening a carton may be necessary if an accurate reading cannot be otherwise obtained. Thermometers should not pierce the outside of wrappers, boxes, or cartons – this can spread microorganisms from the outside of a package into the food. Temperatures of foods in soft, flexible plastic packages, such as bulk milk dispensers, can be obtained by placing the thermometer stem near the center of the package and wrapping the package around the stem (without piercing a hole in the package).

Now that you know the correct techniques for using food thermometers, let’s look at the temperatures that keep the food that you serve safe and healthy.

Temperatures/time for food preparation/handling

Thorough cooking will kill most living microorganisms, but it may not destroy their spores (seed-like structures) or toxins (mold or bacteria waste). This is why it is critical to keep all potentially hazardous foods out of the Danger Zone - 41° F to 135° F as much as possible. Potentially hazardous foods cannot be in this danger zone more than a total of 4 hours. Four hours may sound like a lot of time, but it adds up fast!

KEEP IT HOT (above 135° F), KEEP IT COLD (below 41° F), KEEP IT FRESH, OR DON’T KEEP IT!

Thawing – Here are four safe ways to thaw food:

1. In a refrigerator (at 41 °F or below). Note: Store or thaw raw meats/animal foods in secure containers on the bottom shelf of the refrigerator to prevent cross-contamination.
2. Under cold (70 °F or below), safe, running water for a up to 2 hours*.
   * The period of time allowed for thawed portions of potentially hazardous food to be above 41 °F is 4 hours total. Also, “running water” velocity must be sufficient to agitate and float off loose particles in an overflow. Be careful not to splash this water onto adjacent areas.
3. Cooking frozen food for immediate service (to order).
4. In a microwave oven and immediately transferred to a stove, oven, or other conventional cooking equipment with no interruption in the cooking process.

**DO NOT THAW FOOD AT ROOM TEMPERATURE!** Room temperature is in the danger zone.

**Cooking**
The following are the _minimum_ internal end cooking temperatures necessary for most potentially hazardous foods. Most chefs like to cook foods to hotter and safer levels. All parts of the food MUST reach the following internal temperature(s) for at least 15 seconds:

- Poultry, stuffed meats, stuffed pasta: **165° F**
- Ground meats, including ground beef (hamburger): **155° F**
- An egg, fish, pork, steak, and most other potentially hazardous foods: **145° F**
- Fruits or vegetables: **135° F**

Foods cooked in a microwave oven must be stirred or rotated often during cooking, covered and heated for 2 minutes to a minimum temperature of 165 ° F throughout. Never cook or reheat food in hot holding equipment or add raw food to food that has already been cooked.

**Cooling**
POTENTIALLY HAZARDOUS FOOD MUST BE COOLED TO 41° F FAST.* The key to cooling food is reducing the size or separating the food into smaller or thinner portions and then using the following methods:

1. Placing the food into open shallow pans (pans should be a maximum of 4” deep, with a food product depth of 2”) and then placing them on the top shelf of the refrigerator. Cover, label and date the pan of food only after the food has reached 41° F or lower. Do not stack pans.
2. Using rapid cooling equipment, such as cooling paddles or blast chillers. DO NOT PLACE LARGE AMOUNTS OF HOT FOOD IN THE FREEZER.
3. Stirring the food in a container placed in an ice-water bath (in a sanitized container, avoiding drains).
4. Other effective, approved methods, such as adding ice as an ingredient. Be sure to train your employees as to what cooling methods are used in your operation.
   - the time that the food is cooling (between 41° F - 135° F) should be counted as part of the 4 hours total that food is allowed in the “danger zone”. AFSI does not recommend a “two stage” method, unless it meets with the exact criteria of the 2005 FDA Food Code. Please see Selections from the 2005 Food Code: Times/Temperatures on the AFSI website home page [www.americanfoodsafety.com](http://www.americanfoodsafety.com) for full details.

**Temperatures for hot/cold holding**
Hot foods must be held at 135° F or above. Cold foods must be held at 41° F or below. Temperatures of hot and/or cold food must be checked every 2 hours and recorded on temperature logs. If the food is not at safe temperatures, it needs to be reheated (< 4 hours) or thrown away (> 4 hours). Never mixed raw food with cooked. Do not add “fresh to old”- food that has just been cooked to food that has been “sitting” in holding – replace the inserts, chafing dishes, serving pans, and serving utensils. Keep serving utensils in the hot or cold foods to prevent bacterial growth.

**Reheating**
Foods must be reheated to a minimum internal temperature of 165 ° F quickly – before being placed in hot holding equipment. Maximum time for reheating is 2 hours. Foods may be reheated 1 time.
**Temperatures for storage**
As soon as you open the door to the refrigerator or freezer, the temperature starts to increase as warmer air enters, which is why it is important to keep these units set below the minimum food temperatures and keep these doors shut as much as possible. Consider the use of partial thermal plastic strips at door openings.

Frozen foods must be kept at 0 °F or below. Keep the freezer at about -5 °F.
- Refrigerated foods must be below 41 °F. Keep the refrigerator about 36 °F.
- Dry storage should be kept cool and dry - 50 °F and 50% humidity is ideal.

**Temperature logs**
A temperature log should be kept to ensure that temperatures are being taken. It is recommended that the temperature of foods held in holding equipment are monitored at least every 2 hours. Be sure to include the following information on your record (refer to FDA HACCP Inspection Form as an example):

1. Record the time and date you took the temperature.
2. Record the temperature of the food.
3. Take corrective action immediately and/or train your employees to take corrective action if something unusual occurs, such as hot-holding falling below 135° F.
4. Initials of the person recording the temperature.

Keep temperature logs on file for at least 3 years. They can be very valuable if you need to present the “reasonable care” defense in a lawsuit. Consider “automatic” forms of temperature logs such as PC datalogs.

**Section Seven: Safe Receiving & Storage**
When food is received at your establishment, it is your responsibility to inspect it before you accept delivery. You have an obligation to reject foods that do not meet the Food Code and the right to reject food that doesn’t meet your standards. As you cannot “fix” unsafe foods, follow these rules of safe receiving:

1. Make sure that temperature is correct for each type of food. Always use thermometers to check temperatures. Reject the food if the temperatures are not correct. Record receiving temperatures on the delivery receipts or receiving logs.
2. Reject any food past the use-by or expiration date that is not correctly labeled.
3. Look for any signs of damage, spoilage or contamination.
4. Move foods quickly to storage – do not leave them in hallways or on docks. Remember, foods must be OUT of the temperature danger zone (41° F to 135° F) as much as possible. Store frozen and refrigerated foods first and fast.
5. Keep the receiving area clean, free of pests and well-lit.
6. Develop a policy regarding how to handle a delivery that arrives at a busy work time. You should schedule drivers to arrive at a “slower” times.
7. If you have any doubts about the safety of any food you inspect, separate it for further examination. If foods need to be returned, separate them with “tag out” signs to avoid use.
8. Purchase your foods from approved sources. Get letters of guarantee. With shellfish obtain and keep shell-stock tags for at least 90 days. Mark the delivery dates on the containers.

**Safe Food Storage**
The following rules are useful to ensure the most safe and efficient storage of your foods:

1. Practice FIFO (First In, First Out) method of stock rotation. Store older foods in front of newer foods, so that the older foods are used first. For example, a can marked September 10 should be placed in front of a can marked December 15. Keep food in clean wrapping or containers with dates and labels.
2. Prevent cross-contamination by storing raw animal foods below cooked or ready-to-eat foods.
3. Storage racks should be slatted, 6 inches above floor and away from walls.
4. Do not overload shelves or store food on floors. This invites pests.
5. Keep storage areas, food-transporting carts and trays dry and clean.
6. Throw away food kept beyond the expiration date and reduce future orders.
7. Never leave trash or place garbage cans near food storage.
8. Be sure to keep dry storage foods out of sunlight (which spoils food), and away from overhead pipes or refrigerator or freezer lines (which could drip on food).
9. Establish policies for safe food storage and train employees in these policies.

Fresh meat (lamb, pork, beef)
- Accept fresh meat only at temperature of 41° F or lower and if texture is firm. Reject if brown or greenish; colored blotches; black, white, or green spots.
- If storing different types of raw meat in the same refrigerator, separate the raw meats or fish to avoid raw-to-raw contamination. In addition, follow specific acceptance standards for meats:
  - Beef: accept only if bright, cherry red color with no signs of contamination.
  - Lamb: accept only if light red color with no signs of contamination.
  - Pork: accept only if the fat is white and lean meat is pink with no signs of contamination.

Fresh Poultry
- Accept if temperature at 41 ° F or lower; no discoloration or sticky “slime”; with firm texture; surrounded by crushed, self-draining ice or properly packed in plastic chill packs.

Fresh Fish
- Accept if temperature at 33 - 41° F; no fishy odor; bright, clear & bulging eyes; firm flesh and belly that spring back when touched and packed in self-draining ice.
- Reject if gray or gray-green gills; fishy or ammonia odor; sunken, cloudy eyes; dry gills; flesh is soft and gives; fingerprints stay visible on flesh; scales are secure.

Fresh Shellfish (clams, oysters, mussels)
- Accept if temperature 45 ° F or lower for live shellfish; 0 ° F for frozen product; no strong odor; closed shells, shipped alive; identified by shell stock tag. Be sure the delivery information, including the approved dealers, harvest area and dates on the tags. Keep tags for 90+ days.
- Reject if shells are partly open and do not close when tapped (this means the shellfish is dead).

Fresh Crustaceans (lobsters, shrimp, crabs)
- Accept if temperature is 45 ° F or lower; 0 ° F for frozen product; product is shipped alive; no strong odor; lobster shell is hard and heavy.
- Reject if shells are soft or odors are strong.

Milk and milk products
- Accept if product is 41 ° F or below (be sure to take the temperature using a thermometer); product is pasteurized and delivered before expiration date.
- Butter: make sure there is no bad odor and no signs of mold or contamination.
- Cheese: make sure the outer skin is clean and unbroken and flavor/texture is normal. Abnormal cheese molds can be toxic to sensitive individuals.
Eggs and pasteurized egg products
- Shell eggs: Accept if at 41°F or below (some jurisdictions allow 45°F); no more than one week old; shells are clean and unbroken; packaged in original cartons; labeled with Grade A or AA and U.S. Department of Agriculture shield on cartons.
- Frozen eggs: Must be delivered at 0°F or below; before the use-by date.
- Dry eggs: Accept if packaging intact and delivered before use-by date. Store refrigerated or in cool, dry place away from light. After liquid is added, they must be used right away.
- Liquid eggs: Accept if temperature 41°F or below, pasteurized, and delivered by use-by date. Store immediately under refrigeration. Should be grade “A”.

Frozen Foods
- Accept if temperature 0°F or lower (30°F may be acceptable with some foods used in days).
- Reject if there are signs of re-freezing, such as fluid or frozen liquid inside the cartons; large ice crystals on the product and distorted cartons or products.

Sous Vide ("under vacuum"), Modified Atmosphere Packaged foods (MAP), Reduced Oxygen Package (ROP), “Cryovac” or other low oxygen products (with potential for Botulism)
- Accept only if delivered at temperature listed on the package; frozen product should be delivered at 0°F; delivered by use-by or expiration date and in clean, unripped, packages with no bulges.
- Store at unit temperature of 33°F to 34°F according to manufacturers’ instructions.

Fruits and vegetables
- Accept only when delivered without signs of spoilage, mold, or insects. Store in clean containers quickly, as packing can harbor pests.

Dry goods
- Accept if delivered in undamaged, clean cartons. Check for insects in flour or cereal by sprinkling a bit of product on paper. Reject if any signs of insects.

Canned goods
- Reject if signs of swelled top or bottom, leakage, rust, damaged labels, flawed seams or seals.
- Never taste or open contents of damaged cans, as risk of serious illness is high.
- Never accept home canned fruits or vegetables.

Storing food service chemicals
Here are some common sense rules for safe chemical storage and handling:
1. Make sure all containers are clearly labeled and stored in their original containers.
2. Never use chemical containers to store food, and never use food containers to store chemicals.
3. Never allow chemicals to touch or get into foods. If there is a chance food has been contaminated, throw it out.
4. Store chemicals far away from food handling and storage areas, preferably in a locked cabinet.
5. Clean up spills promptly.
6. After using chemicals, wash hands and change uniform if necessary.
7. Maintain Material Safety Data Sheets (MSDS) for all chemicals in a facility. OSHA regulations require that employees are trained in the safe use and hazards of all chemicals used.
Section Eight: Safe Preparation & Service

Because food is handled often and for long periods of time, contamination – the unintended presence of harmful levels of bacteria – is probable without professional care. Keep in mind that most foodborne illness outbreaks occur because food is improperly handled. Food safety is so simple, it’s hard! Your goals are to reduce handling time, keep proper food temperatures, and limit risk of contamination from your hands, equipment, utensils, and other foods.

Prevent cross-contamination
Cross-contamination occurs when bacteria or parasites from raw foods contaminates cooked or ready-to-eat food through contact with the same surfaces. These surfaces can be hands, gloves, cutting boards, and other utensils or equipment. To prevent cross-contamination:

1. Wash your hands often and well– especially after handling raw foods, touching unsanitary objects, and cleaning.
2. After food has been cooked or prepared, avoid touching foods with bare hands. Bare hand contact with cooked or ready-to-eat foods is illegal. Build-out hand contact with Serv-a-wax type paper, tongs, utensils, sanitary single-use gloves – be creative and safe.
3. Clean and sanitize all utensils and surfaces that touch food – especially knives and cutting boards – after use, whenever changing to another food, and often when preparing continuously (at least every 4 hours).
4. Whenever foods are moved, contain and separate raw animal foods, their juices and anything that they make contact with. AFSI recommends the use of red cutting boards for animal foods that will not be thoroughly cooked and signs to remind food handlers.

Avoiding temperature risks
The temperature Danger Zone is 41° F to 135° F, the range in which microorganisms grow best. Practice these handling techniques and create your own to reduce time at room temperatures. Batch cooking, preparing only the smallest amounts of food necessary is also a display of culinary artistry:
- thaw only what you need and keep it refrigerated.
- work only with the amount you can prepare in less than 1 ½ hours.
- cook food as close to serving time as possible.
- pre-chill all ingredients possible before preparation.

Safe temperatures for cooking
All potentially hazardous foods must be cooked to ensure safety. It is never recommended, hazardous and illegal to serve undercooked ground beef, poultry or pork. These foods carry a risk of serious foodborne diseases to Highly Susceptible Populations (HSP) including children, immuno-compromised, pregnant women, and seniors. However, some foods when handled with skill and care, can be served with a minimum of risk. Ground beef can never be served rare because it contains parts from many animals and is virtually all external area. The internal area of whole (intact) beef steak or roast is sanitary, unless penetrated by parasites, foreign objects or toxins. Also a single piece of beef is from only from one animal, further reducing the risk of contamination. That is why it is generally considered safe to serve rare roast beef (130 ° F for 2+ hours) or medium-rare steaks at the request of a customer, provided the beef did not become contaminated, especially by other raw foods. A consumer advisory must also be properly posted. The minimum safe internal cooking temperatures are correct only when corresponding food safety practices are observed.

AFSI recommends a “target” or policy cooking temperature for most potentially hazardous foods (TCS) of 180° F and hot holding temperatures of 150° F for simplicity and to partially compensate for human errors. Food service management must evaluate the risks inherent in each food and the honest capabilities of their operation to set their own truly safe minimum cooking temperatures.
For the purposes of review and comparison, here are the basic minimum internal cooking temperatures from the 2005 FDA Food Code for at least 15 seconds (local Food Codes may vary):

- Poultry, stuffed meats, and stuffed pastas: 165° F (cook stuffing and meats separately, then insert)
- Eggs in large batches or as part of a food: 155° F
- Ground beef or ground meats: 155° F
- Fish, pork, single eggs and most other potentially hazardous foods not listed above: 145° F
- Vegetables and fruits: 135° F
- Beef roasts: 130 ° F maintained for 120+ minutes throughout
- Any food cooked in a microwave: 165° F (must stir, all parts at 165° F or above, set for 2+ minutes)
- Leftovers: 165 ° F – cook one time and reheat only one time
- Hot holding after cooking: 135° F

Only pasteurized eggs may be used when serving Highly Susceptible Populations (HSP), such as at nursing homes, hospitals, day-care centers, schools, etc. For more information about cooking temperatures or HSP, visit the links section at the AFSI website homepage www.americanfoodsafety.com

Wash all fruits and vegetables before cutting or slicing them. Use only sanitary brushes that are cleaned and sanitized. It is also recommended that melons are chilled before slicing.

**Serving food safely**

The primary rule for servers is “never touch anything that food or a customer’s lips may touch” including parts of utensils, plates, or glasses. Practice the following safe habits:

1. Hold plates by bottom or at edges.
2. Grasp cups by bottom and silverware by the handles.
3. Never reuse unwrapped foods that have been served to customers, such as rolls, relishes or sauces.
4. Scoop ice with long-handled, non-breakable utensils – never with a glass, cup, or bowl.

**Self-service areas/hot & cold holding for customer service**

If you operate a self-service salad or food bar, you must these guidelines:

1. Be sure food protectors, such as sneeze guards are in place during service.
2. Replace all food and utensils that customers may have contaminated by touching, dropping, coughing, or spilling. Monitor with video cameras when possible.
3. Take used plates and utensils and give clean ones to guests who are returning to the food bar.
4. Label food items to prevent “taste testing” by customers, especially with dressings.
5. Post signs to remind customers to take a clean plate with each “trip” or visit to the salad bar.
6. Take the temperature of hot foods at least once every 2 hours, in more than one place. Make sure to check the temperature of the food itself, not just the holding unit. Hot foods should be held at a minimum of 135° F, cold foods at 41° F at all times.
7. Do not mix raw and cooked foods or fresh food with food on display -“never mix new with old”

**Section Nine: Cleaning & Sanitizing**

Clean means free of visible soil, such as dirt and stains which have been removed from the surface using energy, warm water, detergent, and potable (drinkable) rinse water. A surface becomes sanitary when the number of harmful microorganisms are reduced to a safe level. Sanitizers are safe only when used as directed, and in the proper concentration which is measured in Parts Per Million (ppm). For example, chlorine bleach sold in stores is usually about 50,000 ppm. Only a capfull is (about ½ a tablespoon) is needed to yield a solution of 75 ppm. Scented bleach is never permitted.
Water temperature at or above 115° F will inactivate chlorine bleach, as well as mild acid (pH below 6.0) or soapy water with detergents that are mildly alkaline (pH above 7.5). Chlorine can also be corrosive to some metals and irritate the skin. There are many good reasons why reading and following all label directions and Material Safety Data Sheets when using chemical cleaners and sanitizers is very important. As you can see, chlorine and other chemicals must be used with care and knowledge. You must train your employees in their correct use as simple tasks, such as changing the rinse water often (as soap residues build up) is essential to sanitizing.

The recommended minimum concentrations for common sanitizers is: Iodine – 12.5 ppm, Chlorine – 50 to 100 ppm, Quaternary Ammonium Compounds (QUATS) – 220 ppm. The concentration of sanitizers should be measured with test strips/test kits or other method approved by the manufacturer. Never use hot water with chemical sanitizers – most work best between 75° F and 85° F. Measure and mark the outside of your sinks (in gallons) to ensure the correct mix of water and sanitizer.

It is essential to clean and sanitize all food contact surfaces and utensils before and after each use and whenever they make contact with anything unsanitary, including:
- after interruptions in work (because contamination could occur) or when changing products/foods.
- once a day for grill surfaces and griddles.
- at least every four hours for equipment in constant use.

Cleaning utensils and equipment must be stored away from food, to prevent possible contamination.

Manual cleaning and sanitizing of tableware, equipment, and utensils in 3 bay sinks
Use a three-compartment sink for manual cleaning and sanitizing, following these five steps (sinks must be clean prior to use):
1. Scrape, presoak, and sort items
2. In first compartment, wash in clean, hot water (about 115° F) mixed with detergent.
3. In second compartment, rinse in clear, hot water until soap is removed.
4. In third compartment, sanitize using a chemical sanitizing solution in lukewarm water - 80° F
5. Air-dry items for > 15 minutes to give the sanitizer time to finish reducing germs. Do not towel dry.

Cleaning and sanitizing by dishwashing machine
1. Flush, scrape, or soak items to remove visible soil.
2. Make sure machine is clean and spray nozzles are operating properly.
3. Load the machine so all sides of an item can be sprayed by wash and rinse water.
4. Operate machine following manufacturer’s instructions, including hot water temperature usually 185° F as water enters the machine (top) and a minimum of 171° F at the bottom of the dishes/racks.

Proper cleaning and sanitizing of fixed equipment – “Clean In Place” C.I.P.
C.I.P. equipment should be to cleaned and sanitized piece-by-piece, according to manufacturers directions:
1. Make sure all equipment is turned off and unplugged.
2. Unfasten or “break down” all removable parts.
3. Wash, rinse and sanitize each food contact part or surface, making sure to avoid any sharp edges.
4. Utilize any special brushes or cleaning equipment as directed by the equipment manufacturer.
5. Rinse and sanitize other surfaces with chemical sanitizer, following the manufacturer’s instructions.

Using and storing wiping cloths
If mishandled, wiping cloths can become unsanitary and spread contamination. To avoid this risk, use different color wiping cloths and buckets. For example, one could use blue cloths/buckets for wiping food contact surfaces and red cloths/buckets for wiping non-food contact surfaces. Be sure to rinse cloths clean after each use and return them their designated bucket (either food contact or non-food contact). Keep food contact cloths, buckets and sanitizer solution visibly clean. Do not use sponges or thick cloths.
Single-service items

Single-service items are used once and then thrown away. Follow these guidelines:
- store items off the floors, in closed containers.
- do not touch surfaces that touch food or a guest’s mouth.
- wash hands before unwrapping single-service items.
- clean dispensers frequently.
- store these items in a sanitary manner and display in dispensers with the handles or bottoms up.

Garbage and refuse disposal

1. Use wet-strength paper or plastic bags that resist leakage, rodents, and insects.
2. Store bags of garbage inside leak-proof, pest resistant approved metal or plastic containers (dumpsters) with tight lids. Dumpsters must also be stored on sealed surfaces to permit cleaning.
3. Empty garbage regularly to discourage pests.
4. Always wash hands after removing garbage.
5. Keep dumpsters and drain hole lids closed.
6. Rinse out used bottles and containers before placing them in recycling bins.

Waste water disposal

Liquid or other waste cannot enter storm drains. Check local regulations regarding disposal of waste liquids.

The Person In Charge should prepare and use cleaning and maintenance schedules and conduct adequate training. Management should also conduct pre-operation and post-operation inspections to ensure that proper procedures are followed.

There are many ways that food can become contaminated. The important things to remember are that foodborne illness can be prevented through proper procedures in storing, preparing, and serving food, along with proper personal hygiene and correct techniques in cleaning and sanitizing. Your success – your business reputation, the health and safety of yourself, your associates, and your customers depends on your commitment to food safety and the actions you take after this educational experience.

Section Ten: Foodservice Safety

Cuts, burns, sprains, and bruises are the most common forms of accidents in the foodservice operation. Other accidents in the foodservice industry often involve slips and falls, being hit with a swinging door, back injuries from not practicing good body mechanics, injuries from improper use of electrical appliances, fires, etc.

Managers should conduct a safety survey to make sure that potential hazards are eliminated wherever possible. Walk through the establishment, room by room, and make a list of equipment and/or activities that could cause injuries. Then make a list of safety measures that can prevent or eliminate hazards, and implement and monitor those safety measures.

Employees must receive adequate safety training for each type of equipment they use. It is highly recommended, and required by law in some jurisdictions, that all food service establishments have at least one person who is trained in CPR and first aid for choking (Heimlich maneuver).

Video camera systems are highly recommended. They can prevent criminal activity, ensure good work habits by employees, and even reduce unsanitary practices by customers. Many successful foodservice business managers recommend placing a video monitors so people are reminded that they are “on TV”. Check the internet and your insurance carrier for foodservice safety information. AFSI offers a free copy of a government guide to bio security at www.americanfoodsafety.com
Having a good cleaning program in place will help keep food safe. The water supply for all food service facilities must be potable (safe for drinking). There must never be any food preparation done if there is any chance of contamination of the water supply or back up of sewage. Proper plumbing must be carefully maintained to prevent backflow or contamination of the water supply. Cross-connections are any physical link through which contaminants from drains, sewers, non-potable water or waste pipes can enter a potable water supply. To prevent backflow or back-siphonage, use an air gap, or a backflow prevention device (a one-way valve). If a faucet has an opening with a diameter of one inch, the air gap between it and the top of the sink must be at least 2 inches. An air gap is the only completely reliable means of backflow prevention. Air gaps should also be found at the floor level to prevent sewage or drain backups.

If used, a grease trap shall be located to be easily accessible for cleaning, which should be done as often as necessary. Overhead waste-water drain lines can leak and should not be in food storage or food preparation areas. Other overhead pipes located in food storage, preparation or service areas need a gutter-type device to prevent leaks and “drips” from condensation.

Non-potable (non-drinking quality) water supplies shall be used only for air conditioning, fire protection and irrigation, and may not be used where the non-drinking water is allowed to contact food, equipment, or utensils.

Layout of a food service facility must be so that chances of contamination accidents and cross-contamination are eliminated and equipment is easily accessible and cleanable. Employees have to be able to see around equipment and must be able to move around it if they are going to clean and sanitize it. Both the food service facility and equipment must be approved by your local health department and be easily cleanable. Surfaces must be smooth and non-porous. A good reference for facility layout and design is the FDA Food Establishment Plan Review Guide. Check the FDA website at www.cfsan.fda.gov for more information.

If wooden cutting boards and bakers’ tables are used, they must meet the NSF International listing standards and made from a nonabsorbent hardwood such as maple. Food grade, hard rubber, or acrylic (plastic) blocks are preferred. These must be replaced when they develop visible defects – cuts and crevices. Food service equipment should have the NSF International mark or the UL sanitation classification mark. These designations show the equipment has passed their sanitation standards for food service equipment. Select the right equipment for the job making sure your electrical, water, and sewage facilities are adequate for the needs of the equipment.

The facility itself needs to be cleanable with safe materials used on floors to reduce chances of slips and falls. Quarry tile is often used. If ceramic tile is used it must have a non-skid surface, and any concrete must be sealed so it can be cleaned. Ceiling, walls, floors, loading dock areas, and areas where the garbage cans and dumpsters that are light in color will make dirt and spills easier to spot.

Adequate lighting provides the employees with a safer environment which is easier to keep clean. All lights should have a protective device covering them to reduce the chances for breakage and to contain glass pieces if they do break.

Pest Control
Rats, mice, cockroaches, fleas, mosquitoes, and flies spread disease. The microorganisms that pests transmit can be dangerous and kill thousands of people each year. Mice can enter through a hole the size of a dime. One pair of mice can produce 100 offspring in one year. Some female rats can become pregnant at 3 months of age. Most vermin seldom travel more than 250 feet from their nests. Pests breed quickly and can cause serious damage to health, property, and business reputations.
Your first and most important defense against pests is proper cleaning and good building maintenance. Deny pests entry, food, water, and shelter. Keep it clean! Build pests out!

Every food service establishment must hire a licensed Pest Control Operator (PCO). It is important that you hire a PCO with food service experience. A PCO will use the Integrated Pest Control (IPM) strategy, which uses mechanical, chemical, and procedural methods to control pests. A good PCO will be a good “pest detective” to determine what pests could be a problem in your facility and where they can enter, feed, and inhabit. Inspections often include “black light” inspections to detect rodent pest infections. Be prepared to install double doors, repair screen and soffits, patch holes, have trash disposed of more frequently, and make other changes. Good pest control is a good investment for food service businesses.

Often, PCO’s will use a variety of devices in order to detect and monitor insects and rodents. Mostly, these devices are “traps”: “tin cats” or “glue boards” for rodents and “glue boxes” for insects. These traps should initially be placed throughout a building to determine what types of pests exist and where they are located. Do not move or remove these devices unless instructed to do so by the PCO. These devices are part sound pest management control strategy.

Pesticides should be used only as a last resort in a food service facility and applied only by a licensed and experienced PCO. Very few pesticides are legal for use in a food service facility. Boric acid gels are legal and effective against some cockroaches and ants when professionally applied. New, non-toxic repellents and ultrasonic devices are now becoming available which can be effective when used by an experienced PCO.

It is also important to inspect all deliveries for signs of pests. Too often, pests enter an establishment through boxes or bags that were not checked at delivery.

Another new and unique substance for controlling insects is Orange Guard. It is a non-toxic substance that is actually made from food (citrus fruit) products. Free information about Orange Guard can be obtained at the American Food Safety Institute web site: www.americanfoodsafety.com or www.orangeguard.com

Section Twelve: Guidelines for effective employee food safety training

Through this course, you have learned that some food safety hazards and controls are critical and some are lower risk. Start with training objectives or goals that focus on critical controls. Review your training materials to make sure that they are consistent with your policies (and make sure that your policies are up to date and represent current food safety codes and standards). Make a training plan or outline and add items such as the concentration of sanitizers, MSDS, and other information relevant to your establishment. Temperature logs and other elements of the establishment’s food safety system (HACCP), policies, and sanitation standard operation procedures (such as cleaning schedules) should also be included as part of your training program. It is also recommended that the manager demonstrate the proper use and calibration of food thermometers that are used in your establishment.

It is recommended that a variety of training techniques and elements be used, as people have different learning styles. At a minimum, a food safety training plan should include an introductory video and/or literature viewed by an employee before or at the beginning of an employee’s first day on the job. Management should then have a discussion with the employee to make sure that the employee has an understanding of the importance of food safety and their specific tasks in keeping the food that you serve safe.
Once the employee has been introduced to the food safety rules of your establishment and his/her specific duties, they should work with a manager or senior employee to learn his/her tasks “first hand” (one-on-one or applied training). It is important that management and senior employees practice good hygiene and other food safety practices to teach – and lead – by example. It is also important that managers follow up initial training of new employees, to make sure that they don’t invent shortcuts to a job.

If you have never conducted any formalized food safety training before, it is recommended that you establish and implement a food safety training program for all employees as soon as possible. A formalized food safety training program for all employees that handle food is now required by law in some areas, helps provide you with the “reasonable care” defense in the event of a lawsuit, and can increase profits and customer satisfaction. Group training gets employees interacting with each other and standardizes your program. Most establishments use a mix of group and individual, on-the-job training techniques.

Subsequent sessions, on a monthly or quarterly basis, should help to maintain food safety awareness and provide group learning opportunities for employees. Ideas for follow-up training sessions include:

- Watch a short (10-25 minute) safety video, review key points, and discuss the safety policies of your establishment.
- Praise employee(s) for their performance – employee of the month and like awards should include their contribution to food safety and sanitation.
- Discuss a recent newspaper article on food safety and how we can make sure that “it doesn’t happen here”.

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HAZARD ANALYSIS AND CRITICAL CONTROL POINT (HACCP)

HACCP systems are designed to provide a management tool to protect food and prevent potential food safety problems from biological, chemical or physical foodborne hazards that can affect the safety of food. Hazard analysis serves as the basis for establishing critical control points (CCPs). CCPs identify those points in the process that must be controlled to ensure the safety of food. Appropriate parameters or critical limits are established that must be met for each CCP. Monitoring and verification steps are included in the system, again, to ensure that potential risks are controlled. The hazard analysis, critical control points, critical limits, and monitoring and verification steps are documented in a HACCP plan.

A comprehensive HACCP plan and associated records will include all of the following:

1. Listing of the HACCP team and assigned responsibilities;
2. Description of the product and its intended use;
3. Flow diagram of food preparation steps or activities indicating CCPs;
4. Hazards associated with each CCP identified and the preventive measures needed to control the CCP will be specified;
5. Critical limits for each CCP prescribed will ensure the safety of the food without failing to meet the safety criteria of the CCP;
6. Monitoring system(s) will be specified that will indicate the frequency of monitoring, tools or equipment, and the methods to perform the monitoring;
7. Corrective action plans for deviations from critical limits;
8. Record keeping procedures; and
9. Procedures for verification of the HACCP system.

Seven principles that guide development of an effective HACCP plan are listed below.

#1: **HAZARD ANALYSIS** - identification of hazards; biological, chemical, or physical property that can cause a food to be unsafe. The Hazard Analysis Process involves evaluating specific issues about the food or foods being handled such as:

1. ingredients
2. Intrinsic factors of food
3. Procedures used for preparation or processing
4. Microbial Content of the Food
5. Facility design
6. Sanitation
7. Equipment design
8. Food Packaging
9. Intended use
10. Employee health, hygiene, and education
11. Conditions of storage between packaging and consumer use
12. Intended consumer (health, age, etc.)

#2: **IDENTIFY THE CRITICAL CONTROL POINTS (CCP)** - A control point is any point, step, or procedure at which biological, physical, or chemical factors can be controlled.

Each step in the food handling or preparation process can be listed or diagramed to identify each step where control of identified hazards can be evaluated, measured and monitored to determine that safety measures or controls are properly applied.

Common CCP’s for handling or preparation of potentially hazardous food may include: temperature of ready-to-eat foods at delivery; hand washing prior to handling ready-to-eat food, temperature and time for foods that are cooked, cooled, or reheated.

#3: **ESTABLISH CRITICAL LIMITS FOR PREVENTIVE MEASURES** - set or establish a measurable limit or criteria that must be met for each preventive measure associated with a CCP.

Criteria Most Frequently Used for Critical Limits

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature</th>
<th>Aw (water activity)</th>
<th>pH</th>
<th>Titratable acidity</th>
<th>Humidity</th>
<th>Viscosity</th>
<th>Preservatives</th>
<th>Salt concentration</th>
<th>Available chlorine</th>
</tr>
</thead>
</table>

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#4: **ESTABLISH PROCEDURES TO MONITOR CCPS** to indicate that the hazard is under control. This requires use of tools such as a thermometer to make Observations and Measurements. This should be done for all food/menu items handled in the establishment. Observation and measurements should be documented to provide a record that the procedures used for the handling or preparation of food meets food safety requirements. Common measurements may include:

| Visual observations | Temperature | Time | pH  | Aw |

This step will Identify loss of food safety control: what, how, when, who.

#5: **ESTABLISH CORRECTIVE ACTION TO BE TAKEN WHEN MONITORING SHOWS THAT A CRITICAL LIMIT HAD BEEN EXCEEDED.** This step is important to help all employees know what needs to be done when a food safety problem occurs. A written corrective action plan will identify the different options for handling a particular problem and how to change the process to make sure food is handled safely and that the CCP has been brought under control.

#6: **ESTABLISH EFFECTIVE RECORD KEEPING SYSTEMS THAT DOCUMENT THE HACCP SYSTEM**

Records that may be included are noted below:

**Ingredients**
- Supplier certification documenting compliance with establishment's specifications.
- Establishment audit records verifying supplier compliance.
- Storage temperature record for temperature sensitive ingredients.
- Storage time records of limited shelf-life ingredients.

**Preparation**
- Records from all monitored CCPs.
- Records verifying the continued adequacy of the food handling procedures.

**Packaging**
- Records indication compliance with the specification of packaging materials.
- Records indication compliance with sealing specifications.

**Finished Product**
- Sufficient data and records to establish the efficacy of barriers in maintaining product safety.
- Sufficient data and records establishing the safe shelf-life of the product; if age of product can affect safety.
- Documentation of the adequacy of the HACCP procedures from an authority knowledgeable of the hazards involved and necessary controls.

**Storage and Distribution**
- Temperature records.
- Records showing no product shipped after shelf life date on temperature-sensitive products.

**Deviation and Corrective action**
- Validation records, records that indicate revision of the HACCP plan due to observed deviations and changes in ingredients, formulation, preparation, packaging, and distribution control; as needed.

**Employee training.**
- Records indicating that food employees responsible for implementation of the HACCP plan and understand the hazards, controls and the procedures.

**PRINCIPLE #7: ESTABLISH PROCEDURES TO VERIFY THAT THE HACCP SYSTEM IS WORKING**

Scientific or technical verification that the critical limits and CCPs are satisfactory. Verification ensures that the facility’s HACCP plan is functioning effectively. Documented periodic revalidation, independent audits or other verification procedures.