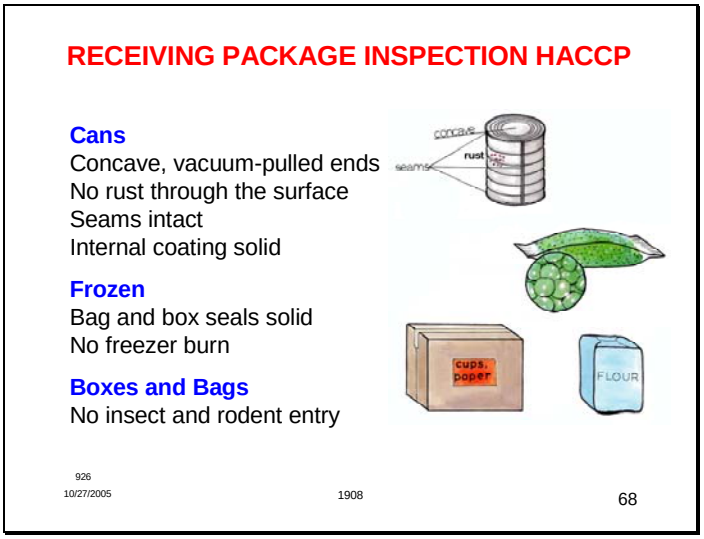
SECTION 5



926

Receiving

Delivery vehicles should be inspected and receiving personnel should reject any product if the food temperature is not appropriate to the food. The FDA Food Code recommends that cold ready-to-eat food be received at 41ºF or below. Shell eggs and milk and dairy products must be received at 45ºF or below and must be cooled to 41ºF within 4 hours after receipt. Shelf stable items can be received at ambient temperature.

There is no specified receiving temperature for frozen foods in the FDA Food Code. Foods that are labeled frozen must be received frozen and there should be no evidence that the food has been thawed and refrozen.

Incoming food products should be inspected for frozen or chill temperatures, date codes, damage, suspicious odors and drips, and pest infestation. Refrigerated and frozen items should be stored within 10 minutes of receipt.

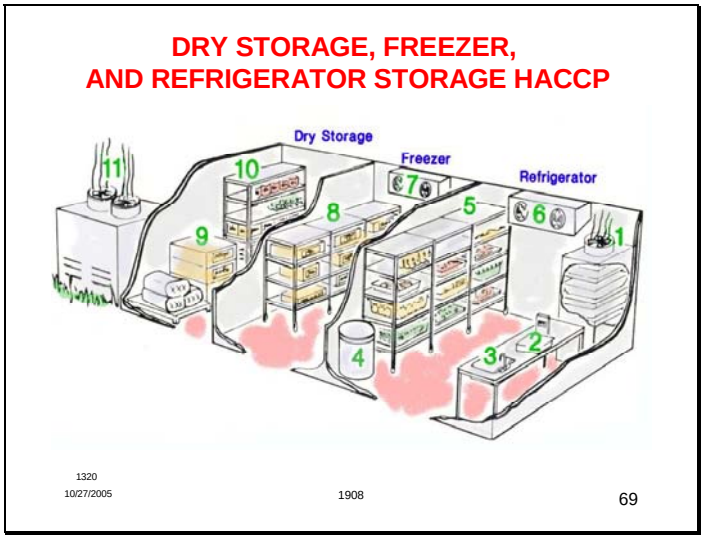
The top, bottom, and side seams of food cans should be checked. Any that are dented in these sensitive areas should be rejected. Dents in the solid areas are not hazardous. Check also to see that the ends of each can are concave. This means that the vacuum seal is still present. Any convex or bulging cans of food should be rejected. Bulging cans of food should not be opened because botulinum toxin could squirt in the face and mouth of the individual opening the can. Bulging cans of food should be wrapped tightly in a plastic container and returned to the supplier.

Unopened cans of food may be refrigerated. After opening cans of food, the contents should be placed in food grade containers before being stored in the refrigerator. Some cans still have lead seams that will dissolve into the food and contribute to heavy metal poisoning.

Any frozen foods that show signs of thawing and refreezing should be rejected. The quality of the product is greatly reduced when this occurs. Watch for ice crystals, solid ice, and stains on the surface and in the package. A torn package causes the condition of freezer burn, where water has been permanently dehydrated from the food surface.

Any boxes and bags that are not clean, not intact, and show signs of rodent or insect entry should be rejected. All food should be unpacked at the back door because it is common to find cockroaches and mice in boxes, depending on the cleanliness of the warehouse from which the items were shipped.

The manager or supervisor should be immediately notified of any substandard food item to determine if the product should be kept, discarded, salvaged, or returned to the supplier on the delivery vehicle. Discarded items should be recorded on the waste control report.



1320

Storage HACCP

The FDA Food Code recommended cold holding temperature for food is 41°F or below.

An accurate thermometer must be placed in each refrigerator and freezer. It should be placed in the warmest part of each unit, which is usually near the door.

Refrigerators

For extended quality, refrigerated food should be stored at 33 to 40°F. When meat, fish, and poultry are stored at or less than 32ºF off-flavors in meat, fish and poultry products are reduced because the multiplication of spoilage bacteria is reduced.

The usual air flow in a refrigerator, about 20 to 40 feet per minute, is not enough to rapidly chill food within a safe period of time. A rapid chilling area can be created by installing one or more fans on a rack in a suitable space in the refrigerator. (**1** in the figure above) There must be air at less than 35°F with a velocity of more than 1,000 feet per minute flowing across the pans of food, in order to cool 2-inch deep product in less than 6 hours.

An optimal salad preparation area **(2, 3)** in the refrigerated area allows preparation of top-quality cold food.

Refrigerator and freezer floors must be kept dry to avoid personal injury. Food should be kept 6 inches off of the floor. Only in some cases, where certain non-hazardous foods are kept in specific moisture-proof containers, can food be stored on the floor **(4)**. However, there are some health agencies that do not allow any floor storage.

Ready-to-eat food must be stored above raw food, especially raw meat, fish, and poultry, to avoid cross-contamination **(5)**. Store food in FDA-approved plastic or stainless steel containers. Aluminum foil and aluminum containers are dissolved by food acid. Cloth is not acceptable for covering food. Seamed metal cans, glass jars, and plastic bread bags should not be used for storing food after the original contents are removed.

Label and date all food on the front of the container. Do not label lids, as lids may get separated from containers. Rotate the food according to the date. Refrigerated food should be used within 7 days at 41ºF to assure that low-temperature pathogens will not multiply to hazardous levels.

Floors, walls, and shelves should be cleaned and then sanitized with a quaternary ammonium sanitizer solution (or equivalent sanitizing solution) to control spoilage bacteria, on a regular basis (at least once a month or more often if necessary).

Freezers

The FDA Food Code states that "stored frozen food shall be maintained frozen." There is no FDA required temperature for freezer operation. However, the quality of frozen food is better when the freezer temperature is -10°F or below. Frozen food should not be stored any longer than necessary because freezers fluctuate in temperature and cause quality changes in frozen food **(7)**. Boxes of food should be separated to allow air circulation **(8)**. The freezer should be swept out monthly, cleaned and sanitized, and inventoried on a regular basis.

Compressor Maintenance

The refrigerator (and freezer) compressor must be kept cool **(11)**. The standard NSF refrigerator is only good for keeping cold food cold. It is not sized for cooling. For every 10°F the compressor is above 90°F, it loses 10% of its cooling capacity. In order to keep foods at 41ºF, refrigeration units should operate at 38°F or below.

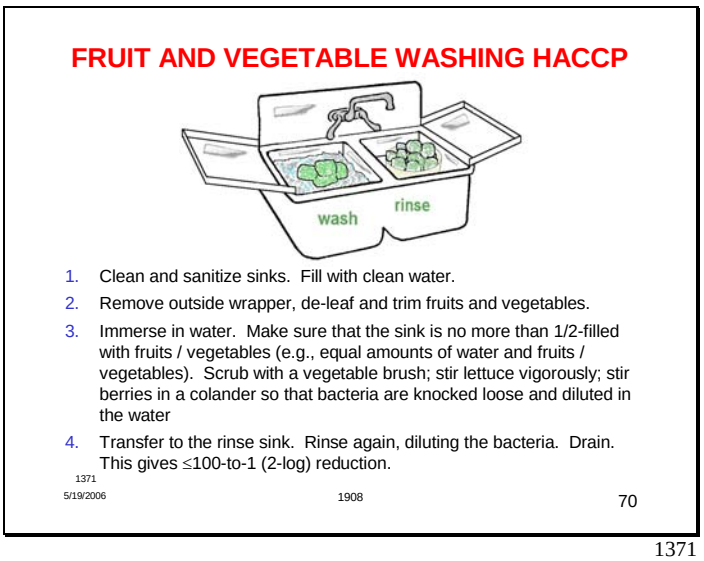
Shelf-Stable (Non-Perishable) Food Storage

Non-perishable storage areas should be kept below 70°F and 70% humidity. Floors and surfaces must be kept spotlessly clean in order to discourage the presence of insects and rodents. (Pesticides do not keep insects and rodents out of the facilities.) Free-standing shelves, 2 inches from the wall, and at least 6 inches off of the floor, should be used for product storage. Drainage racks, shelving, pallets, dollies, or similar devices should be used to store food 6 inches above the floor and away from the walls to ensure good air flow around the inventory **(9, 10)**. No food should be stored on the floor. Duckboards should not be used as storage racks. No food should be stored in restrooms, lockers or dressing rooms, or vestibules. No food should be stored under unprotected overhead sewer waste or water lines (except fire protection sprinkler heads).

All stored foods should be kept properly covered except during periods of preparation and service. Unused portions of opened food must be stored in a tightly closed approved food-grade bulk container and labeled. Stock should be dated and labels turned so that they can be seen. All bulk food and food ingredients containers must be labeled with the common name of the product, name and address of manufacturer, net weight, and ingredients in descending order of predominance.

Chemical Storage

Chemicals (detergents, sanitizing chemicals, pesticides, etc.) must be labeled and kept separate from foods and stored in a separate cabinet or storage area away from the food storage areas. All empty chemical containers must be disposed of properly.



1371

Contamination of Fruits and Vegetables

Fruits and vegetables are commonly washed to remove surface residue and soil as well as pesticides and herbicides.

It is now also recognized that there are health risks associated with the consumption of fresh fruits and vegetables. Fresh fruits and vegetables can support the growth of pathogens. They have been involved in foodborne illness outbreaks because of the consumption of products contaminated by pathogenic microorganisms such as hepatitis A virus, *Cryptosporidia*, *Listeria monocytogenes*, *Yersinia enterocolitica*, *Escherichia coli* O157:H7, *Shigella* spp., and *Salmonella* spp. Fruits and vegetables are also subject to the growth of various spoilage microorganisms that include bacteria, yeast, and mold.

Contamination of fruits and vegetables occurs at all points of production, from growing and harvesting to processing. Polluted growing conditions and/or poor hygienic practices during processing increase the risk of contamination with foodborne pathogens.

Washing Fresh Produce

Washing fresh fruits and vegetables will not completely eliminate all microorganisms from fruit / vegetable surfaces, but it must be done sufficiently enough to reduce numbers of microorganisms to an acceptable level.

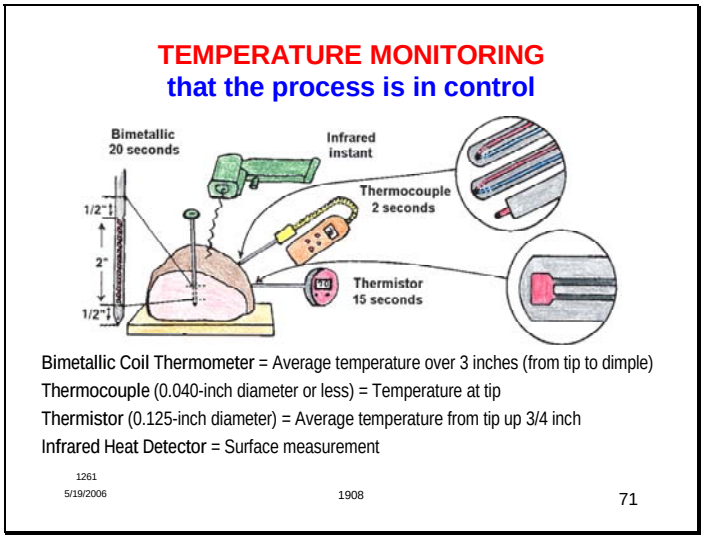
Procedure

To reduce the risk of high levels of pathogens and chemical contaminants on fruits and vegetables, the following procedure should be used.

1. Clean and sanitize sinks. Fill with clean water.
2. Remove outside wrapper, de-leaf and trim fruits and vegetables.
3. Immerse in water. Make sure that the sink is no more than 1/2-filled with fruits / vegetables (e.g., equal amounts of water and fruits / vegetables). Scrub with a vegetable brush; stir lettuce vigorously; stir berries in a colander so that bacteria are knocked loose and diluted in the water
4. Transfer to the rinse sink. Rinse again, diluting the bacteria. Drain. This gives ≤100-to-1 (2-log) reduction.

This washing procedure must be used in the production of cold, ready-to-eat salads, desserts, and any other menu items to which fresh fruits and vegetables are added without cooking or any type of pasteurization step.

Immune-compromised people are encouraged not to consume any fresh fruits and vegetables. They should consume only canned fruits and vegetables or items that are well cooked.



1261

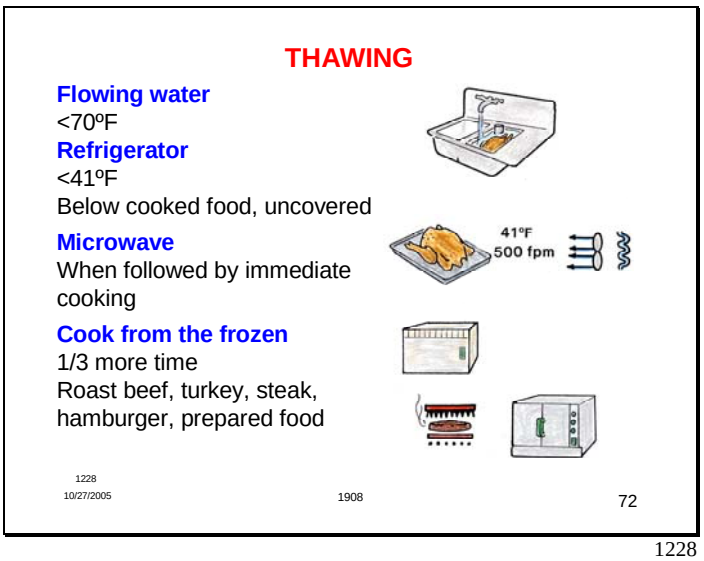
Temperature Measurement of Food

A critical procedure in microbiological hazard control is to correctly measure food temperature. A major cause of many foodborne outbreaks has been that the cook could not accurately measure the temperature of cooked eggs, pork chops, hamburgers, etc. because of the government-recommended bimetallic coil thermometer. As shown in the figure, the temperature sensor is a bimetallic coil in the end of the stem. However, it extends up the thermometer approximately 3 inches. To make a temperature measurement, the thermometer must be inserted in the food more than 3 inches. The problem is that the coil only averages the temperature over the 3 inches. Therefore, it is impossible to accurately measure the temperature of any food other than a pot of soup or gravy that is being vigorously stirred to assure that the entire pot of soup has no more than a 1ºF variance anywhere in the pot. When a foodservice operator uses a bimetallic coil thermometer with the intent to assure that the food is cooked enough to make it safe, he/she has no defense if a customer is made ill and sues the establishment. Following the FDA Food Code when the code is incorrect is no defense in a lawsuit.

Another problem with the bimetallic coil thermometer is that it must be calibrated almost every day because the dial changes. To calibrate this type of device, first an insulated container of crushed ice (90% ice, 10% water) is made. This provides a 32ºF reference temperature. Then, the thermometer is immersed in the ice at least 3 inches. A pair of pliers is used to hold the nut behind the head of the thermometer, and the head and dial are twisted with the fingers until 32ºF lines up under the pointer. Since these thermometers get out of adjustment so easily, they must be checked and adjusted daily if used daily.

The correct way to measure temperature is with a **thermocouple** or **thermistor** thermometer. These devices are electronic thermometers and essentially, need no adjustment. When they do not work, it is time to change the battery. The thermocouple thermometers shown in the figure are highly accurate to)1ºF and measure temperature at the junction of two very fine wires that are the diameter of a hair, which are in the tips of the probes. The meters come to temperature in approximately 3 seconds and measure the temperature at a point of about 0.05 inch. Hence, it is easy and accurate to find the hottest and coldest points in eggs, hamburger, pork chops, fish, chicken, etc., before they are removed from the cooking device.

The thermistor electronic thermometers shown in the figure are also highly accurate, ±2ºF, and do not require calibration. Their limitation is that they are slow to come to less than 1ºF of the actual food temperature, about 20 seconds. The reason is that the temperature sensor is a small resistor in the tip, about 0.125 inch in diameter, and it takes time to heat up or cool down. Because of the size of the sensor resistor, this device can only measure a spot about 0.5 inch in diameter.



1228

Thawing

The critical issue when raw meat, poultry, and fish are thawed is that they can be contaminated with high levels of pathogens. Care must be taken so that other products do not become cross-contaminated.

When food thaws, spoilage begins. Yeasts and molds begin to multiply at 15°F and spoilage bacteria at 23°F, because enough ice has become liquid in the interior of the food. Food should be thawed rapidly under controlled conditions in order to delay spoilage. The three FDA-approved thawing methods are: refrigerator thawing, thawing in running water, and thawing during cooking

Refrigerator Thawing

Food may be safely thawed in a refrigerator at 41°F or less. It may take 2 to 3 days to thaw some foods in ordinary refrigerators. There are special refrigerators designed for rapid thawing of frozen foods. These rapid thaw refrigerators have fans for quick heat transfer to the food. If frozen food is removed from its packing case and placed within 4 inches of a fan blowing full force on the product, it will thaw in 12 hours instead of 3 days.

Running Water

Running drinking (potable) water can be used if the water temperature is less than 70°F. The water must have enough force and agitation to float away loose food particles and prevent nutrient build-up. The easiest way to thaw with running water is to put a pot in the sink, place the food in the pot, and then let the water run into the pot. A second method is to clean and sanitize a sink, especially the drain area; install an overflow pipe; place the food in the sink; and add the flowing water. The running water method of thawing has never been tested in a laboratory, and care should be taken when this method is used. When this method is used, the outside of the food soon reaches 70°F, which is a good growth temperature for pathogens and spoilage bacteria. This method of thawing could lead to a food safety problem if not controlled. The method is probably based on the idea that water will remove some bacteria from the surface.

Thawing During Cooking

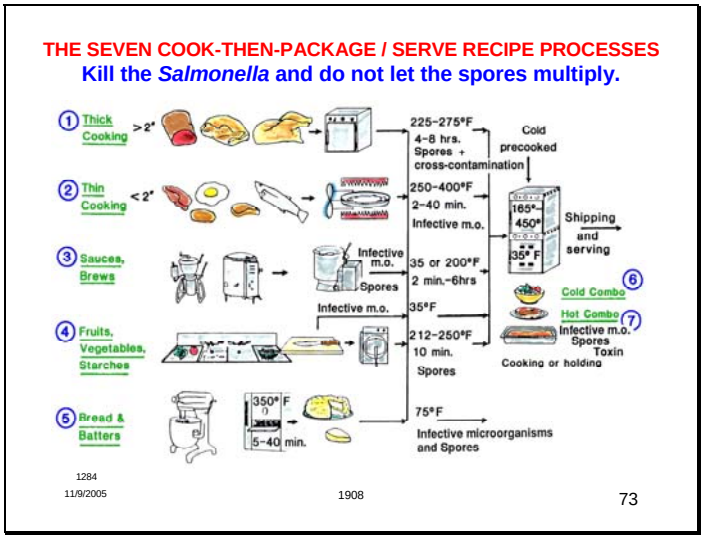
The best way to avoid all thawing problems is to cook food from the frozen state. Foods such as frozen vegetables are thawed during the cooking process. Any item, from hamburgers and roasts to frozen prepared entrees can be cooked from the frozen state. More cooking time is required when food is cooked from the frozen state in order to ensure product doneness. The internal temperature of products (particularly raw meat and poultry items) cooked from the frozen state should be measured with a thermistor thermometer to assure that adequate temperatures have been reached.

Food may be thawed in a microwave oven if immediate cooking follows such thawing. When food is thawed in the microwave, there is usually overheating of the food's edges. Bacteria will multiply in these areas if these foods with warm spots are held a long time before cooking.

Thawing at Room Temperature

While research has shown that food can be safely thawed at room temperature, this is not accepted by any regulatory agency.

Food should not be thawed with a fan blowing hot kitchen air at 95°F on the food. Hot air warms the surface of the food or food product allowing pathogens and spoilage microorganisms to multiply rapidly.



1284

The Seven Quality Assurance Recipe Processes

There are millions of combinations of ingredients that produce recipes with all varieties of flavors, appearances, textures, and aromas. However, each one is not a unique HACCP problem, because all recipe processes fall into one of seven food processes or combinations of the seven processes for safety control. It is necessary to be aware of potentially hazardous food. Once a person learns to conduct a hazard analysis for each of the seven processes, finds the critical control points for the hazards, and specifies quality assured recipe procedures, a safe process can be specified for any recipe. The goal or key is to kill the vegetative cells of pathogens and not to let pathogenic spores or toxin-producing pathogens multiply to levels that diminish food safety. The seven basic recipe processes are as follows:

Thick, Raw Protein Items, More than 2 Inches Thick (1 Inch Center to Surface)

These items are solid or cannot be stirred. Therefore, they are subject to heating and cooling by heat conduction. Examples include: prime rib of beef, whole poached salmon, turkey, roast pig or steer, or a packed basket of crab to be steamed. These foods must be cooked at lower temperatures (225 to 325°F) for longer times (1 to 8 hours) to prevent surface burning, unnecessary shrinkage, and water loss before the center reaches the doneness temperature required for customer satisfaction and safety standards.

The thickest part of the item must reach the pasteurization temperature for an established period of time. In order to decrease cooking time and ensure that large pieces of meat are cooked adequately, they should be cut into pieces that are less than 6 inches thick. For example, to speed the roasting of turkey and also prevent the breast meat from becoming overcooked, the legs and thighs can be removed and cooked separately from the carcass containing the breast. Sectioning the turkey in this manner opens the cavity of the bird and cooking time is shortened because heat transfer occurs from the inside as well as the outside.

Since cooking takes a long time, vegetative cell destruction on the surface of large pieces of meat or poultry is assured. After cooking, spore outgrowth may occur if the temperature of the meat or poultry after slicing is below 130°F for more than 2 to 4 hours.

These items present problems as leftovers because they are thick and difficult to cool and reheat later. Having leftover food should be avoided, if possible. If these thick items become leftovers and are solid pieces, then it can be assumed that the center does not have any spore contamination and as long as the surface cools safely, the food is safe. If the item is a large chuck-formed turkey or beef roast or meat loaf, then the center must be cooled as rapidly as possible in order to prevent spore outgrowth.

As an alternative, a product such as roast beef can be kept at 130°F until the next meal. However, since there can be a 12- to 15-hour time lapse between supper and lunch the next day, there may be significant quality loss even though the product is safe to eat.

Thin, Raw Protein Items, Less than 2 Inches

These items can be solid, such as a steak or chop, or a mixed product such as hamburger or ground sausage. The center to surface distance of these items is very small, less than 1 inch. Other examples include: small fish and fish filets, chicken pieces, pancakes, grilled sandwiches, and eggs.

These items can be heated rapidly, and are cooked at high temperatures (250 to 400°F) for a short time (2 to 40 minutes) to a desired internal temperature that meets both customer satisfaction and safety standards.

The key element to assure safety of these products is to heat them to an adequate center temperature for a sufficient period of time in order to kill vegetative pathogenic cells. These thin items usually receive a lot of handling and can be contaminated with many pathogenic bacteria (e.g., *Escherichia coli* and *Salmonella* spp. in ground beef patties, and *Salmonella* spp. and *Campylobacter jejuni* in chicken). An adequate temperature and time for the center of thin foods is given in the following table.

FOOD PASTEURIZATION TABLE

Temp (°F)	Ground Meat and Fish		Roast Beef		Shell Eggs, Other Raw meat and Fish, (not ground)	All Poultry
	5D Kill (100,000:1 Calculated)	FDA Code	6.5D Kill (3,160,000:1 Calculated)	FDA Code	FDA Code	FDA Code
130			112 min.	112 min.		
140	8.6 min.		11.2 min.	12 min		
145		3 min.		4 min.	15 sec.	
150	51.6 sec.	1 min.	67 sec.	67 sec.		
155	16 sec.	15 sec.				
158	5 sec.	Instant	6.7 sec.	0		
165						15 sec.

If food is not cooked to these temperatures in order to ensure the destruction of vegetative pathogens, the food, such as ground beef, must be certified as "low pathogen" by the supplier so that it will not make anyone ill if eaten raw. "Low pathogen" means that the pathogenic vegetative infective microorganism (such as *E. coli* O157:H7, *Salmonella*, *Shigella* spp., and *Campylobacter jejuni*) count of the ground beef is not detectable in 25 grams. Cooked thin items should be kept above 150°F for quality (130ºF for safety) and eaten within 30 minutes to assure maximum nutrient retention.

Chicken and turkey products probably have the highest pathogen counts. When they are cooked to achieve a pasteurization time and temperature of 165ºF for 15 seconds, they are safe. People prefer dark meat of poultry cooked to 185ºF for quality.

Whole pieces of fish should be cooked to a center temperature of 145°F for 15 seconds or more, or be certified by the supplier as having a safe pathogen and parasite count.

Meatloaf should be no more than 2½ inches thick and must be cooked to a pasteurization time and temperature used for ground meat products.

When raw meat, fish, or poultry, are deep-fried, microwaved, or charbroiled, the center temperature of the product must meet pasteurization standards. Food being cooked in the microwave should be covered with an appropriate plastic film, paper towel, or glass cover to ensure even heat transfer and prevent surface cooling due to evaporation. The food should be rotated or stirred during cooking, heated until all parts reach 165ºF or more, and allowed to stand covered for 2 minutes after cooking.

Pasteurized in-the-shell eggs should be used in foodservice operations serving "sunnyside-up" or "over-easy" eggs. Unpasteurized shell eggs must be cooked to a center temperature of greater than 145ºF for 15 seconds to ensure destruction of *Salmonella* microorganisms. Pasteurized liquid or dried egg products are commonly used in foodservice operations. They are convenient and safe, because processing methods have ensured destruction of salmonellae.

If meat is to be incorporated into a casserole, it can be prepared and used hot, or, because it is thin, it can be cooled easily to 41°F or less in less than 6 hours on a sheet pan in a refrigerator. Once cold, it can be incorporated into combination dishes.

Because thin foods can be cooked rapidly and can be prepared as needed, there should be no need to hold products for long periods of time, and there should be no leftovers. Therefore, spore-forming microorganisms should not be a problem.

Stocks, Sauces, and Brews

Hot examples include soups, sauces, stocks, jams, and custards. Cold examples include icings, cold dressings, cold sauces, batters, eggnogs, ices, and ice cream. Hot items can be mixed and heated rapidly. [This heating process will inactivate (kill) vegetative pathogen cells.] Some products such as beef stock are subject to long holding for extraction. Once cooked or prepared, stocks, sauces, and brews are usually not served all at once and are often used over a period of many hours to support a meal service requirement. This means, they are subject to the hazards of possible spore outgrowth associated with long-term inadequate hot holding. Sauces and soups should be held at greater than 150°F (for quality) in a bain marie. Soups and sauces should not be thickened until 10 minutes before being served. Thickened soups and sauces are more difficult to keep at a uniform temperature. Egg and heavy cream sauces, which do not tolerate continuous 150°F holding, should be freshly prepared every 2 hours unless a lab test indicates that the acidity of the sauce is below pH 4.1. Leftover stocks, soups, and sauces may be difficult to cool. These products should be cooled in shallow containers (with a food depth of 2 inches or less). However, the goal must be to have a minimum of leftovers.

Fruits, Vegetables, Starches, Seeds, Nuts, and Fungi

These items require sorting and washing to remove dirt, hard foreign objects, chemicals, and many forms of microbiological contamination from the soil, irrigation water, and the hands of workers who cultivate, pick, and handle the products. They must be double washed in a sanitized sink. Once cleaned, they can be used cold in salads, fruit dishes, etc., or cooked. Most fruits are sufficiently acid to prevent the survival and multiplication of pathogenic microorganisms. This is not true of low-acid vegetables and starches that may be contaminated with the vegetative cells and spores of *Clostridium botulinum* and *Bacillus cereus*. These items must be kept cold or dry or packaged to allow air exchange before cooking. Cooking kills vegetative cells of microorganisms, but after cooking, vegetables such as green beans or potatoes, or cereals such as rice, will have activated spores and must be maintained at greater than 150°F (quality) or cooled to 41°F or less within 6 hours (FDA Food Code). Uncooked vegetables are basically non-hazardous unless they are stored in airtight bags at temperatures above 50°F. At this temperature and above, *Clostridium botulinum* might multiply. This is why vegetable bags and packages must have two $^{1}/_{8}$-inch holes that allow oxygen to enter the package.

Pasta and rice are non-hazardous in their dry, uncooked state. Once these products are cooked and rehydrated with water, they become potentially hazardous. Seeds and nuts are likely to contain shell particulates. Some seeds and nuts contain low levels of mold toxins and can be hazardous.

Doughs and Batters

Most baked products are non-hazardous because of their low water activity. They can become hazardous if too moist or covered with contaminated icings or toppings. They must always be considered hazardous when filled with egg custards, meat pates, or other high-water-activity, high-quality protein food. Icings and protein (milk and egg) fillings should be cooled before they are used on or in baked products according to government recommendations. The FDA Code recommends cooling food from 135 to 70°F in 2 hours, followed by further cooling to 41ºF within a total time of 6 hours or less. The USDA recommends cooling food within 90 minutes after cooking, from 120°F to 55°F within 6 hours, followed by further continuous cooling to 40°F (no time limit).

When a hazardous topping such as an egg white meringue is baked or browned, the center temperature of the meringue and temperature at the interface of the pie and meringue must reach 160°F for more than one second. The pie and meringue must be cooled to 41°F or less within 6 hours (FDA Food Code), or cooled from 120 to 55°F, followed by continued cooling to 40°F (no time limit) (USDA Guidelines).

Cold Combination Dishes

Cold combination dishes are composed of meat, fish, poultry, sauce, starch, vegetable, and fruit. Examples of cold combination dishes are potato salad, pasta salad, tuna salad, egg salad, and ham salad, and sandwiches made with meat, fish, poultry, eggs, and cheese. When cold combination dishes are prepared, all ingredients must be washed and prepared separately and kept at 41°F or less. Pasta, potatoes, or rice to be used in these cold combination dishes should be cooked and chilled to 41°F before combining with other cold ingredients. Flavorings and commercially sterilized spices should be added to sauces or

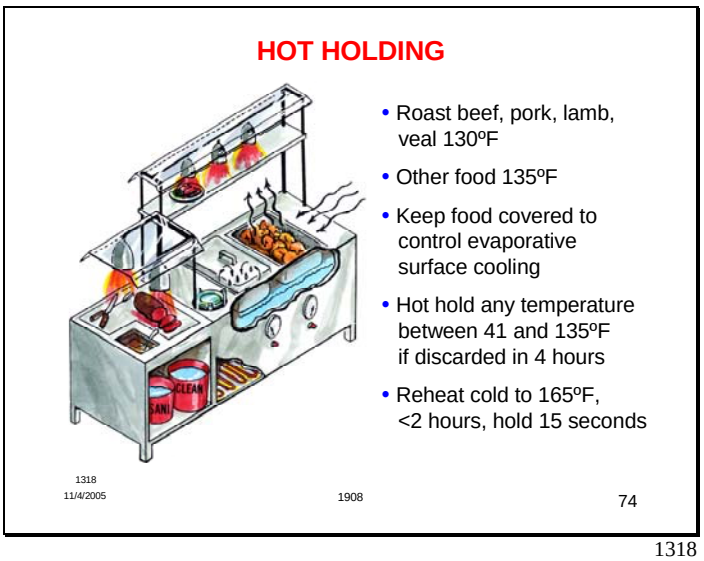
dressings before mixing into the other ingredients. All ingredients should be pre-chilled to 41°F and maintained at or below 50°F during preparation. This way, the vegetative cells that will be in the food due to raw ingredients added at the end, or contamination from a cutting board, can be controlled. Leftovers can be avoided by preparing small batches that will be used within anticipated periods of time. Clean, sanitized utensils and containers must be used to prepare these dishes to minimize vegetative cell contamination. If the food is kept sufficiently cold, spore outgrowth should not be a problem.

Cold combination dishes can be especially hazardous, because they have all of the potential problems of the initial ingredients, along with extended handling times at kitchen temperatures. After preparation, cold combination dishes should be refrigerated at 41°F and consumed as soon as possible, in less than 7 days.

Hot Combination Dishes

Hot combination dishes are composed of mixtures of meat, fish, poultry, sauce, starch, vegetable, and/or fruit. Examples of hot combination dishes are beef stew, chicken a la king, chili, meat pie, spaghetti sauce and meatballs, and oysters Rockefeller. When hot combination dishes are cooked or pre-cooked, ingredients must be combined and reheated to reach a center temperature of 165°F for more than 15 seconds. This kills the vegetative cells. Pans of casserole, stew, and chili must be heated to 165°F within 2 hours.

Hot combination dishes are especially hazardous, because they have all of the potential problems of the initial ingredients, along with extended handling times at kitchen temperatures when spores can outgrow and multiply at these favorable growth temperatures. Once prepared, hot combination dishes should be either kept above 135°F, or cooled and stored refrigerated at 41°F or less. If held at 150°F, they should be served and consumed within 2 hours for quality.



1318

Food Preparation Methods

Progressive food preparation is the method of cooking food just prior to service. This "cook and serve" method of preparation provides fresh food and avoids having leftovers. It avoids the problem of pathogen multiplication during inadequate hot holding of food. However, many foodservice operations want to prepare food in advance in order to assure adequate supply and utilize personnel more efficiently.

When food is prepared ahead of service (the "cook and hold or store" method), bacteria can multiply in the food if it is not kept hot (above 130°F), or cooled rapidly. The FDA Food Code recommends that hot food be held at 135°F and above, or be continuously cooled to 41°F in 6 hours or less (135 to 70ºF in 2 hours; followed by further cooling to 41ºF or less). The USDA Guidelines for Cooling is to continuously cool food, within 90 minutes after cooking, from 120 to 55°F within 6 hours, followed by further cooling to 40°F (no time limit) before boxing.

Food must be kept above 150 to 165°F for customer satisfaction. Therefore, if there is not a frequent demand for food on the line, it will continue to cook and lose quality. During slow periods, only keep small amounts on the serving line. Do not add fresh on top of old food. For highest quality in flavor and nutritive value, food should be eaten within 30 minutes after it is cooked.

Food Holding

Inadequate hot holding of food contributes to foodborne illness due to two factors: **evaporative cooling** and **inadequate temperature control**. Evaporative cooling occurs when water on the food surface evaporates and absorbs energy and cools the food surface. The surface gets dry and unappealing. This can be prevented by covering the food being held. Food must be kept at 130°F for roasts and 135ºF for all other food, or above, and covered as much as possible to assure safety. The entree food temperature when eaten for maximum customer satisfaction is 150°F, and the preferred temperature for hot beverages (e.g., coffee) and soups is 165°F.

Hot holding cabinets lose temperature rapidly when doors are open. Keep hot hold drawers and doors closed as much as possible.

Serving, Packaging, and Transporting

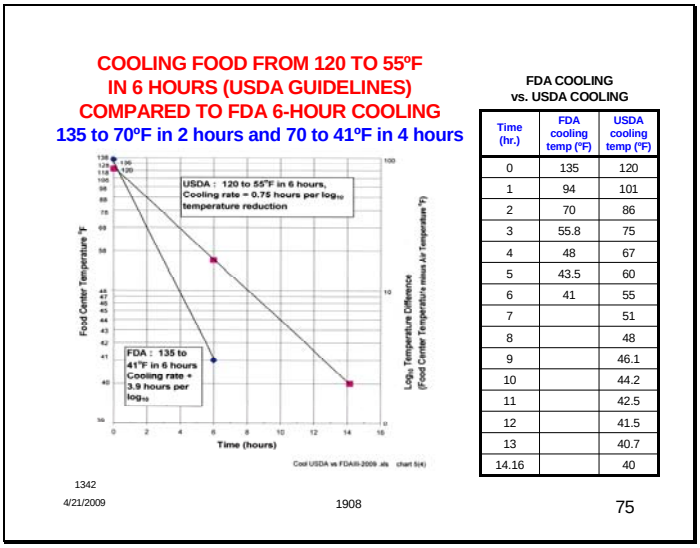
Food open on a buffet or service line must be maintained at a center and surface temperature of greater than 135°F. For customer satisfaction, replace individual portions with fresh portions every 20 minutes. Casseroles should be replaced every hour. When food is packed for transport, it must be packed in a preheated container. There must be tests (temperature checks) that indicate the food will stay hot (greater than 135°F) until final service.

Self-Service Food, Dishes, and Utensils

Customers returning to a buffet line must use clean dishes to avoid a contamination problem. For example, customers have been known to put food on their dish, decide they took too much, and then put it back. They can return with a used cup or glass for refilling.

Leftover Handling

Leftovers should never be mixed with fresh food. Cooked leftovers that have a pH less than 4.6 or a_w of less than 0.86 are safe. Food must be cooled to 41°F within 6 hours according to the FDA Food Code, or cooled according to USDA Guidelines. Reheated precooked food (except beef) should reach a center temperature of 165°F in 2 hours or less and be maintained at this temperature for at least 15 seconds to get a good pasteurization. To assure rapid reheating, cut or spread large amounts of food so that the maximum center to surface distance is less than 1 inch. Roast beef may be reheated to 130°F.



FDA COOLING vs. USDA COOLING

Time (hr.)	FDA cooling temp (°F)	USDA cooling temp (°F)
0	135	120
1	94	101
2	70	86
3	55.8	75
4	48	67
5	43.5	60
6	41	55
7		51
8		48
9		46.1
10		44.2
11		42.5
12		41.5
13		40.7
14.16		40

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Food Cooling

To control pathogen growth, the cooling process must begin when the food temperature is 130ºF or higher, because *Clostridium perfringens*, which is the highest-temperature pathogen, begins to multiply at 125ºF and grows very rapidly between 125 and 85ºF.

Two lines are shown in the graph. One is for the FDA Food Code cooling recommendation: 135 to 70ºF in 2 hours and 70 to 41ºF in 4 hours. This is almost a straight-line, 6-hour cooling curve when plotted correctly on a semi-log graph. The FDA should not have presented this as a two-segment process.

The second line shows cooling food according to USDA Guidelines. The USDA recommends that food be cooled, within 90 minutes after cooking, from 120 to 55°F within 6 hours, followed by further cooling to 40°F (no time limit) before boxing.

The actual temperature drop per hour for each of the two cooling procedures is shown in the following table**.**

COOLING TIMES AND TEMPERATURES

FDA 6-Hour Cooling 135 to 41ºF (38ºF Environment)		USDA Cooling 120 to 55ºF in 6 hours, followed by cooling to 40ºF (38ºF Environment)	
0	135	0	120
1	94	1	101
2	70	2	86
3	55.8	3	75
4	48.0	4	66
5	43.5	5	60
6	41	6	55
		7	51
		8	48
		9	45.5
		10	43.9
		11	42.5
		12.6	41
		14.16	40

The way to measure cooling as shown in the graph is to position the tip of the thermocouple in the middle of a pan (1 inch up from the bottom in the center) of a thick, sticky food 2 inches deep. Take temperatures of the food and of the air every hour, and plot the difference between the refrigerator temperature (driving force) and food center temperature, as shown. Once you have a few points for the line, you can take a ruler and draw a line to 55ºF or 41ºF, and read the time from the bottom axis. This is a big advantage, because one does not need to be present at the end to collect data.

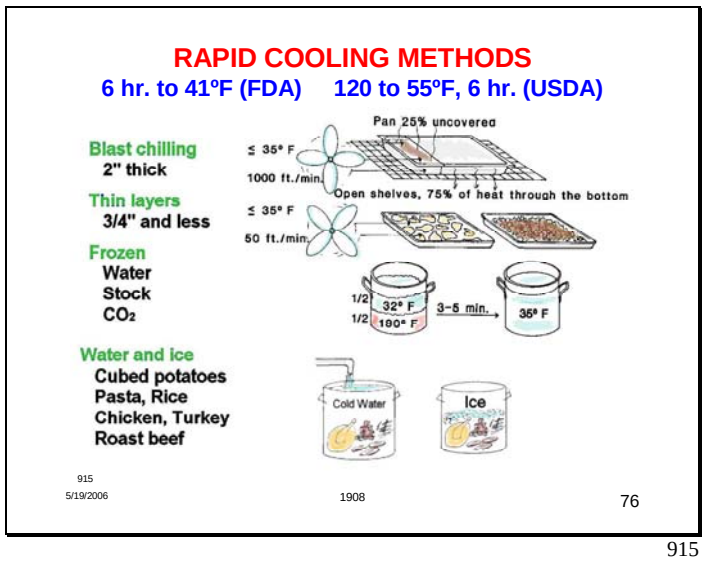
When a food cooling curve is plotted on semi-log paper and marked as shown above, with the bottom line 1 degree above the air temperature of the refrigerator (or cold source such as water), a straight line is obtained. In the examples shown, it is assumed that the center temperature of the hot food is at 135°F (FDA) or 120°F (USDA) when cooling starts. The right axis of the graph shows actual food center temperature. The left axis shows the difference in temperature between the food center temperature and the cooling medium, in this case, air at 38ºF. If the cooling medium were ice, the driving force temperature would be 32ºF.

Because of the large temperature difference between the food and cooling unit air, heat is removed easily in the first hours and the temperature drops 19 degrees to 101 (USDA cooling) or 46 degrees to 94°F (FDA 6-hour cooling). In the second hour, the temperature drops 15 degrees to 86°F (USDA cooling) or 24 degrees to 70ºF (FDA 6-hour cooling), in the third hour to 75°F (USDA cooling) or 55.8ºF (FDA 6-hour cooling). In the final hour the food cools 1 degree to 40°F (USDA cooling) or 2.5 degrees to 41ºF (6-hour cooling).

Note that when food is cooled continuously to 41ºF (6-hour cooling), over half of the heat must be lost in the first hour of cooling. This means that single-door, ¼ horsepower refrigerators do not have the necessary Btus to cool more than 10 pounds of food in 6 hours. Underpowered refrigerators approved by NSF and lack of knowledge by food workers are the major reasons that food cooling is the number one cause of foodborne illness.

Another critical element of cooling is removing the heat as it comes from the product to the surface of the container. When there is a fan less than 4 inches from the side of the pan of food, blowing air at less than 35°F at a velocity of 1,000 feet per minute, it is possible to cool a covered container of 2 inch deep, hot food such as chili in 6 hours to 41°F. A standard refrigeration unit cannot circulate air at high velocity. The air velocity in a standard walk-in or reach-in refrigerator is only about 20 to 40 feet per minute. It will take about 14 hours to cool a 2-inch deep pan of typical food such as beef stew or lasagna.

Typical NSF commercial refrigerators are designed only to keep pre-cooled food between 40 and 45°F (with the door never opened). Refrigerators are not designed to cool food. Refrigerators meet NSF (National Sanitation Foundation) Standard 7 requirements when the units are new in the factory, if they hold 38 (±2ºF) for 4 hours in the center of the refrigerator, nothing in the refrigerator, and the door never opened. To cool the same 2-inch deep food to 41ºF in 6 hours requires a blast chill refrigerator, costing approximately $20,000.00, with a 1½ hp compressor (vs. ¼ hp in a normal NSF refrigerator) and fans circulating air at a velocity of 1,000 feet per minute (vs. 50 feet per minute in a normal NSF.



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Pathogen Growth and Contamination During Inadequate Cooling

Cooking eliminates most of the vegetative spoilage organisms, which competitively inhibits the growth of vegetative pathogenic microorganisms in raw food. Spores of *Clostridium botulinum*, *Clostridium perfringens*, and *Bacillus cereus*, however will survive the heat process of pasteurization and cooking and can germinate and multiply in the food if it cools too slowly.

Large containers of food cool very slowly. For example, a 4-inch deep steam table pan of food will take 30 hours to cool to 41°F or less in an ordinary NSF refrigerator. This amount of time gives microorganisms the chance to multiply to hazardous levels.

Regulatory Requirements for Cooling Food

The FDA Food Code recommends cooling food from 135 to 70°F within 2 hours followed by further cooling to 41°F (6 hours or less, total time).

The USDA Guidelines for cooling food are: "Continuously cool food, within 90 minutes after cooking, from 120 to 55°F within 6 hours, followed by further cooling to 40°F (no time limit) before boxing." This has been shown to be safe by the USDA.

Effective Food Cooling in Six Hours

The following is a list of methods that can be used to cool food from 135 to 41°F within 6 hours as recommended by the FDA Food Code.

1. The food can be blast chilled by spreading the food in containers or layers that are no more than 2 inches thick or in a pot less than 6 inches in diameter. The pan of food should be placed within 4 inches of a fan. Air at 35°F or cooler (25 to 30°F is best) is blown across the pan at 800 to 1,000 feet per minute. A summer floor fan works well. Two-inch-deep, covered food will cool in 4 to 6 hours, depending on density. If food is left 25% uncovered, it will cool in about 2 to 2½ hours. However, uncovered food can become contaminated with spoilage bacteria, yeasts and molds because of contamination of the refrigerator evaporator coils and refrigerator air, and the food will probably be spoiled in less than 5 days.

   An open rack or wire shelf must be used to hold the food because 75% of the heat comes out of the bottom of the pan. Solid shelves and/or stacking pans of food on top of each other will double the cooling time.
2. Another method of cooling food quickly, although not as good a method, is to place hot foods in small pieces of less than ¾ inch thickness on sheet pans. If the food is uncovered, even in a holding refrigerator without a blast cooling fan, it will cool in 2 to 3 hours because of the exposed surface area. Food cooled in this manner will become moldy in a few days. However, if the food is used within 2 days, this method of cooling is an acceptable temporary solution.

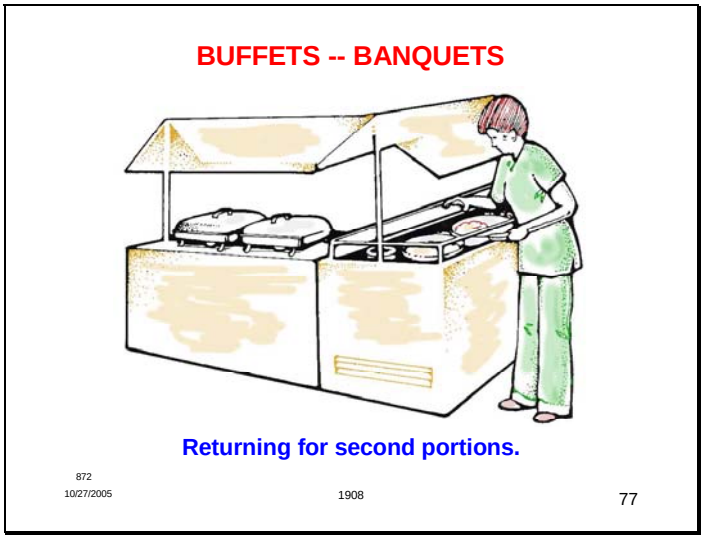
   If the food is spread out on sheet pans, covered, and placed in front of a fan (blast cooling), it will cool in 1 hour. The depth of the food should never exceed 2 inches in the blast cooler, or it will not get to 41°F in 6 hours.
3. Ice / dry ice cooling. Sauces can be cooled rapidly by making them with half as much liquid, and then adding the other half of the liquid as ice or a frozen ingredient such as milk to finish the sauce. The temperature of the sauce will equilibrate to 35°F in about 5 minutes. Dry ice pellets are also good for cooling a stock that cannot be diluted with water. The dry ice carbonates the stock slightly. The carbonation is useful because it acts as a mild preservative during cold holding. As soon as the stock is heated the carbonation escapes as a gas.
4. Ice bath cooling. Many food items can be cooled with a combination of flowing water, then ice, when refrigeration is limited. After chunk solid foods such as chicken, beef cubes, pot roast, turkey, potato cubes, macaroni, or rice in perforated pans are cooked in a pot, the pot is taken to the sink, and cold water is added. When the food approaches 70ºF, most of the water can be poured off, and a couple of scoops of ice added. The iced water cools the product to 41ºF in just a few minutes. Large items (e.g., whole, cooked turkey and beef) can also be cooled in this manner. Cold food should be stored in covered containers in the refrigerator at ≤41ºF. Products cooled rapidly in this manner have a long shelf life.

Refrigeration

Most foodservice refrigerators are not designed for cooling food, only for keeping it cold. If an operation is going to cool more than just a few pans of leftovers, the operation needs to have a walk-in cooler with fans located in areas where they can blow across the hot pans of food. The refrigeration compressor needs to be increased another 0.25 horsepower for every 20 pounds of hot food to be cooled to 41°F in 6 hours.

Reach-in refrigerators are not blast cooling units. There are some good, but expensive blast cool refrigeration units, which can be purchased from equipment suppliers. However, it is a simple matter to make an existing walk-in refrigeration unit into a blast cooler. (Write HITM for information.)

As mentioned previously, meat, fish, and poultry stored at 30°F spoils about 5 times slower than if stored at 41°F. It is possible to purchase a refrigeration system that holds food at 30°F by buying a freezer with a thermostat and compressor for 30°F. The cost is about 10% more than the cost of a standard freezer. (Write HITM for more information.)



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Maintaining Safety and Quality During Buffets

Buffet Lines

Buffet tables must be maintained in an appetizing and safe manner. Time and temperature abuses that allow microbial growth can cause displayed food to become hazardous and cause illness if consumed. To maintain quality of cold foods, use a cold rail and display cold foods 3 inches below the top of the rail. Salad bar refrigeration units with cold air flow is the best method of displaying and serving cold food items. Using ice in a mechanically refrigerated salad buffet bar is not recommended, because the ice acts as an insulator around food items.

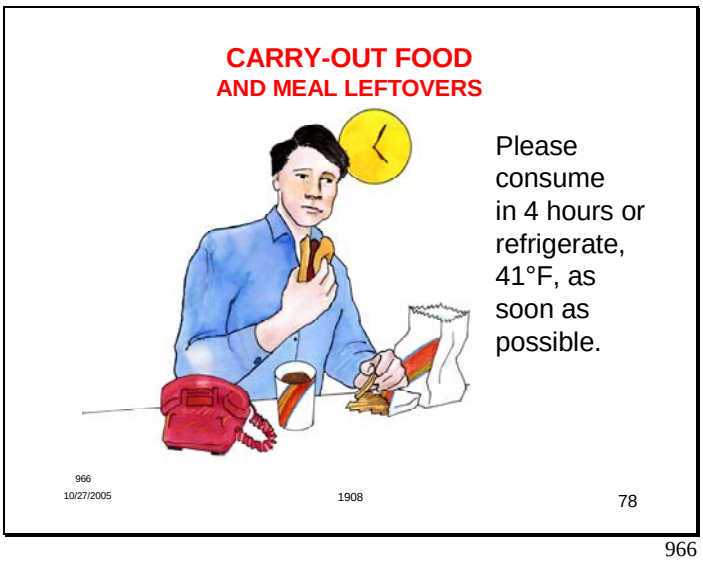
Hot foods must be kept hot. Only enough vegetables to be served within 15 minutes and only enough meat, poultry, fish and casserole items to be served in 30 minutes should be placed on buffet lines. Foods on display should be replenished frequently.

It is wise to use sneeze guards for buffet service foods. This barrier does not guarantee that food will not become contaminated but it does provide a certain amount of protection against customer contamination. If a customer is sick with a viral respiratory infection and sneezes on the food, the virus can infect another unsuspecting customer who eats the food, even pastry and breads.

Policies must be established for employees to follow for buffet service.

Re-use of Tableware

The FDA Food Code prohibits re-use of silverware and plates on banquet, buffet, or salad bar self-service lines. Cups and glasses can be used again. The reason for this is that after a customer has used a plate and silverware, the tableware is contaminated. If customers return to a food line, put more food than they want on their plates and then return a small portion to the serving vessel, they can also contaminate the food on the buffet line.



966

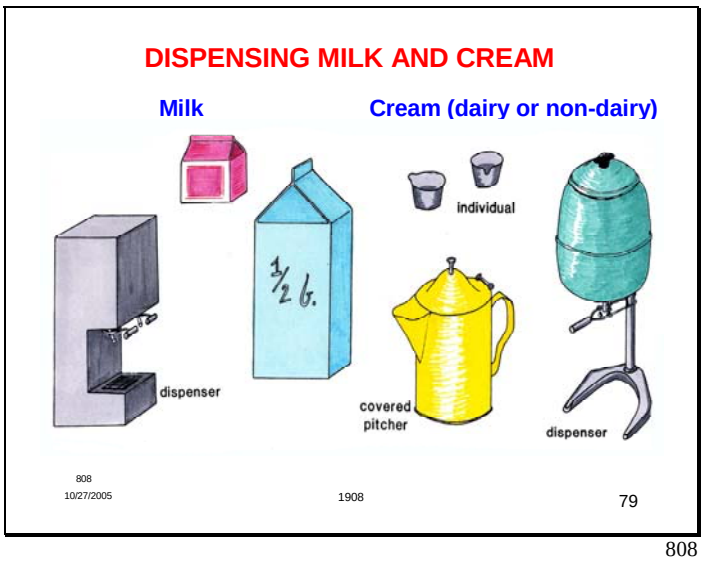
Carry-out Foods - Controlling the hazard

For quality assurance, customers must be informed how to treat food after purchasing. Customers must be told that the food is perishable and that it should be consumed promptly, refrigerated below 41°F, or kept hot (above 135°F).

The hazard associated with carry-out foods is that these foods often do not remain below 41°F or above 135°F while they are being transported from the place of preparation and sale to the place where they will be consumed. Poor packaging allows foods to change temperature rapidly. Foodservice establishments are legally liable for any take-out foods that are sold.

Control the hazards in carry-out foods by:

1. Packaging food as hot or cold as possible, using well-insulated packages. Pre-packaged food items should not come in contact with water or undrained ice.
2. Preparing, storing, serving, and packaging food, using methods for maintaining both the quality and safety of the food products.
3. Informing customers that the food should be eaten as soon as possible (within 30 minutes) to retain quality. If the food is to be consumed at a later time, it must be kept hot (above 135ºF) or chilled and kept refrigerated, out of any bag, below 41°F.
4. Never using any food returned by customers. This food must be considered to be grossly contaminated and it must be discarded.



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Dispensing Milk and Cream - FDA Requirements

Dispensing Milk

Refrigeration units in milk dispensers inadequately maintain milk at cold storage temperatures. Milk should be removed from the dispensing units at the end of the day in order to avoid souring. Plastic tubing at the end of containers of milk should be cut at a 45-degree angle to allow the milk to flow freely. Blunt cuts on tubing can cause milk to back up in the dispensers. As a result, it will not be used and it will sour.

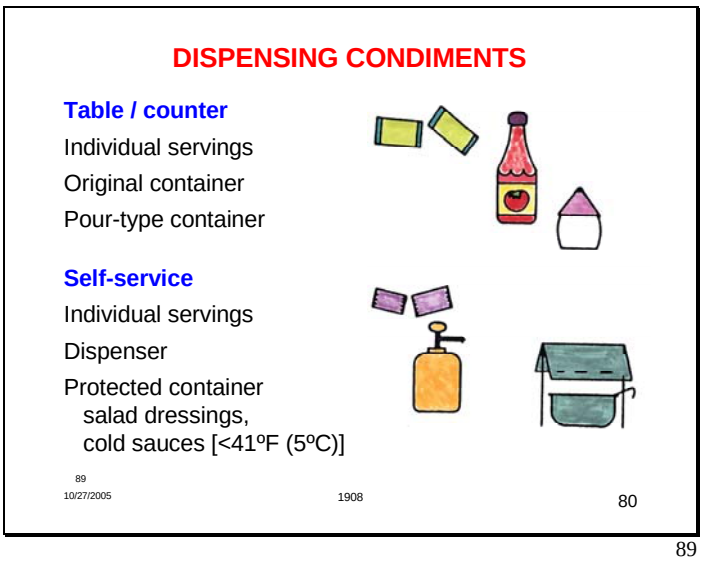
Dispensing Cream

An opened creamer is hazardous. Uncovered containers of cream are not permitted by law. Cream placed on tables must be served in covered containers. Covered cream containers must be checked and monitored on a regular daily schedule so that sour cream is never served. Only the amount of cream that the customer can be expected to use should be given out.

Individual non-dairy creamers should be considered potentially hazardous and must be refrigerated. Also, these containers are not tamper-proof, since someone could peel off the top (which breaks the seal) and then carefully push it back on so that it looks sealed.

References

NSF. 1978. Food Service Equipment Standards. National Sanitation Foundation, Ann Arbor, MI.



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Dispensing Condiments - FDA Requirements

Condiments, seasonings, and dressings for self-service must be provided in any of the following: individual packages, dispensers, containers protected from contamination by packaging, easily cleaned containers, serving line or salad bar protector devices, display cases, etc. Ketchup and other sauces may be served in the original container or in a pour-type dispenser.

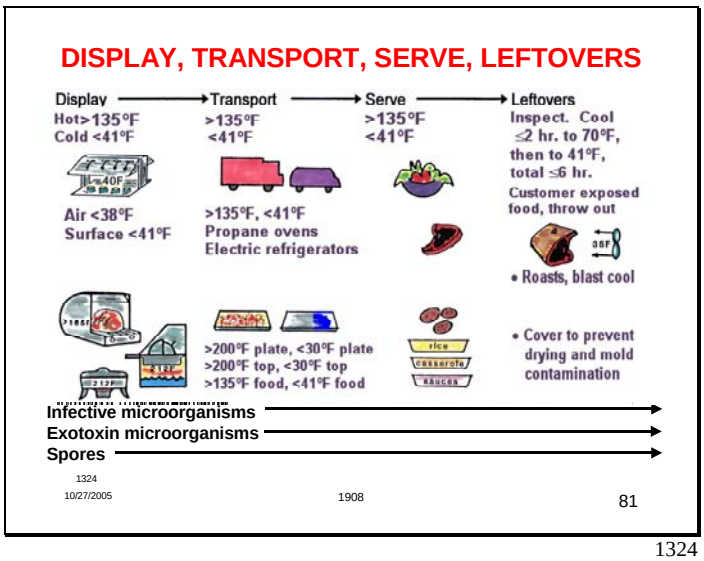
Ketchup bottles should not be refilled. Yeasts and molds in the air contaminate opened bottles of ketchup. If fresh ketchup is placed in a bottle containing ketchup that has been used to serve customers, the sensory quality of the ketchup will decline rapidly due to the rapid growth of spoilage microorganisms.

Pump dispensers must be cleaned daily to ensure consistent dispensing of condiments.

A regular rotation schedule for all condiments must be established. To ensure quality and avoid contamination, salt, pepper, sugar, and ketchup should be periodically emptied and/or changed.

Any product displayed in a container into which the customers can put a utensil they have had in their mouths must be thrown away when it is removed from the customer's table. For example, any salad dressings served in an open container or dish must be discarded.

Commercial salad dressings are usually microbiologically safe products because of their high acidity. However, these salad dressings can deteriorate as a result of yeast or mold growth and oxidation of lipids, which alters their flavor. These products should be dispensed in limited quantities and replaced after a prescribed period of time.



1324

Food Safety and Quality for Display, Transport, and Leftovers

Display, Transport, Serve, Leftovers

This stage in food handling is probably the most hazardous of all. In order to control both the safety and quality of food products the following procedures must be followed:

1. **Display.** Cold food must be kept below 41°F. The temperature of circulating air above food in salad bars and display cases should be less than 41°F. Ice under bowls of food in salad bars does not keep surface temperatures of food at less than 41°F.

   Hot-held food must be above 135°F and kept covered in order to prevent evaporative cooling. Infrared lights and other types of heat lamps dry the surface of food products and do not maintain a safe surface temperature.
2. **Transport.** Food being transported must be above 135°F or below 41°F. All catering trucks should have propane ovens and/or electric refrigerators.

   Under some very limited conditions it is possible to transport food in insulated boxes. If insulated containers are used, it is essential that the food be put in at a temperature of about 180°F or hotter in order to allow some heating of the box from the heat given off by the food. The hot food should be placed in the box and the lid must be kept closed until the food is served or the food will cool quickly.

   The best method is to transport the food cold and reheat it at the delivery point. In hospitals and in large hotels, hot food can be transported satisfactorily for up to 15 minutes. In these conditions the food must be above 200°F, plated on a plate at above 200°F, and covered with a heated stainless steel cover at a temperature of above 200°F. If foods are to be kept cold, plates should be below 30°F, the cover below 30°F, and the food below 40°F. Chilled food can be reheated in various thermal and microwave ovens prior to serving.

   Hotel room service food is transferred in aluminum tote boxes. It is common practice to put 1 or 2 sterno cans in the boxes to maintain the hot temperature of foods. Lighted cans of sterno are a non-uniform heat source; the food either overcooks or gets cold. Lighted cans of sterno are also a fire hazard.
3. **Serving.** Food should be either served above 135°F or below 41°F.
4. **Leftovers.** The FDA Food Code recommends cooling food from 135 to 70°F within 2 hours followed by further cooling to 41°F (6 hours or less, total time). Roasts should be cut to less than 2 inches and panned less than 2 inches deep in order to facilitate rapid cooling to 41°F in less than 6 hours.

   Customers should never be given hot food from a banquet to take home. The potential for abuse is great; home refrigerators are often inadequate for cooling food.

Infective Microorganisms

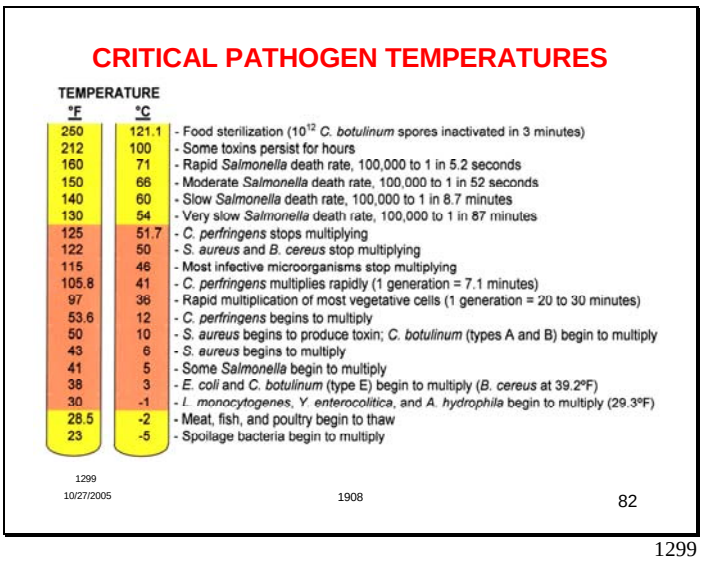
Handling of the food during transport, display, and service introduces infective microorganisms into the food. If the food is not maintained above 130°F or below 41°F, microorganisms will grow to levels that cause foodborne illness.

Exotoxin Microorganisms

Exotoxin-producing microorganisms such as *Staphylococcus aureus* can be introduced during transport and display. If given an opportunity for growth, they can produce toxins that are not inactivated when foods are reheated.

Spores

Spores are present in the food throughout the handling process. If the food is not maintained cold or hot, spores outgrow, multiply and cause foodborne illness.



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Critical Temperatures

The range for critical temperatures in foodservice is from 30 to 125°F. Multiplication of some spoilage microorganisms occurs above and below this range, but no pathogenic microorganisms will multiply outside of this range.

23°F Spoilage bacteria begin to multiply. Enzymatic activity causes deterioration of frozen food, even down to **-40°F**.

28.5°F Meat, fish, and poultry begin to thaw.

30°F *Yersinia* spp., *Listeria monocytogenes,* and *Aeromonas hydrophila* begin to multiply (**29.3°F**).

38°F *Escherichia coli* and *Clostridium botulinum* (type E) begin to multiply. *Bacillus cereus* begins to multiply at **39.2°F**.

41°F Some *Salmonella* spp. begin to multiply. Food must not be held for more than 7 days, or more than 10 multiplications of pathogens.

43°F *Staphylococcus aureus* begins to multiply, but it does not produce a toxin until the temperature of the food goes above **50°F**. The temperature range of 40°F to 50°F allows food to be out of the refrigerator for a short period of time during preparation in a kitchen. Thirty minutes is probably a reasonable time limit for preparing food before it is cooked or returned to the refrigerator. Food should always be returned to the refrigerator at less than **50°F** unless it is cooked immediately.

50°F *Staphylococcus aureus* begins to produce toxin. *Clostridium botulinum* (types A and B) begin to multiply.

53.6°F *Clostridium perfringens* begins to multiply.

95-97°F The temperature of rapid multiplication for most pathogenic bacteria.

105.8°F *Clostridium perfringens* can multiply once every 7.1 minutes in ground beef.

115°F Most vegetative cells stop multiplying.

122°F *Staphylococcus aureus* and *B. cereus* stop growing.

125°F *Clostridium perfringens* stops multiplying. This is the highest growth temperature for a pathogen.

130°F Vegetative infective pathogens such as *Salmonella* spp. can be reduced from 3,160,000 microorganisms per gram of food to less than 1 per gram (6.5 D) in 112 minutes. This is the lowest temperature and time to which food should ever be cooked.

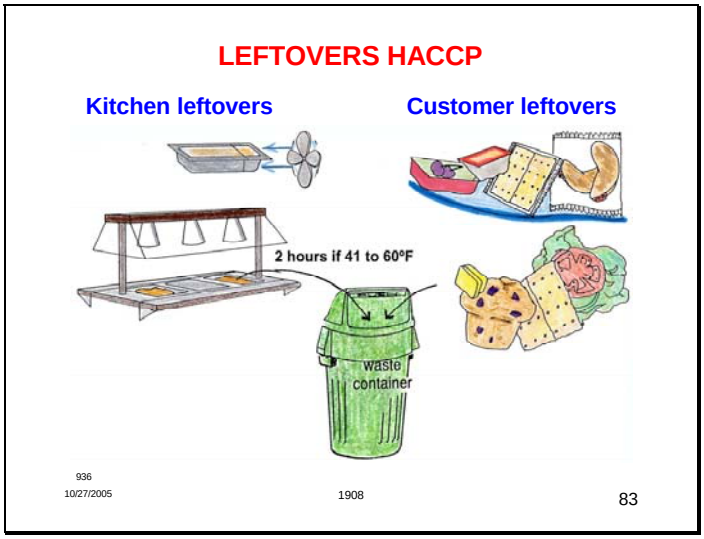
140°F Destruction of *Salmonella* spp. is 10 times faster than at 130ºF. At 140ºF, 3,160,000 *Salmonella* spp. per gram of food is reduced to 1 per gram (6.5 D) in 11.2 minutes.

150°F At this temperature, a population of 3,160,000 *Salmonella* spp. per gram of food is reduced to 1 per gram (6.5 D) in 1.12 minutes (67 seconds).

160°F Rapid destruction of pathogenic vegetative infective microorganisms such as *Salmonella* spp. occurs. 3,160,000 *Salmonella* spp. per gram of food are reduced to 1 per gram (6.5 D) in 0.112 minute (6.7 seconds). Some spoilage microorganisms survive heat at this temperature. These vegetative cells remain in the food and cause it to spoil during refrigerator storage.

212°F All vegetative cells are destroyed, but spores survive. Toxins that may have been formed during the growth phase of *S. aureus* and *B. cereus* will remain unchanged and toxic for hours at this temperature.

250°F This is the temperature for sterilization of food. Spores of *C. botulinum* at a concentration of 10^{12} per ml in the center of a can of food are reduced to 1 in 3 minutes during the commercial canning of food.



936

Leftovers HACCP

Leftover food lacks the quality found in fresh food and may not be safe to use.

The flavor of leftover food changes due to oxidation of fats and development of other off-flavors caused by spoilage microorganism multiplication. Tomato ketchup, for example, has enough acid to prevent the multiplication of pathogenic bacteria, but is easily contaminated with yeasts and molds, which grow and produce off-flavors and gas.

Kitchen leftovers are both a safety and quality problem. If at all possible, leftovers should be totally avoided through production controls and creatively designed production systems. Leftover ketchup, for example, can be used in a barbecue sauce.

All leftovers should be inspected and any questionable products must be discarded. Prepare leftover food for chilling by slicing meat and placing it in layers that are no more than 2 inches deep in shallow pans. Cool pans that are no more than 2 inches deep. Pans of food being cooled should be only three-quarters covered so that evaporative cooling will aid in the temperature drop. Food can be chilled rapidly with 35°F (or less) air moving at a rate of about 1,000 to 1,500 feet per minute to 41°F or less within 6 hours.

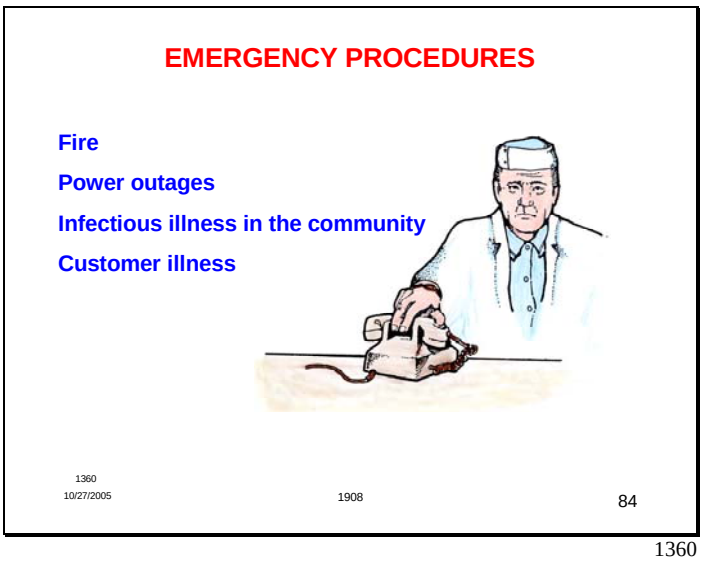
Leftovers should never be combined with fresh product. This practice causes the fresh product to spoil much faster because of the contaminating microorganisms from the old product. Any food to be reheated must be inspected. **If there is any doubt about the safety of the food, throw it out!** If the food is judged to be safe, it should be reheated to at least 165°F for 15 seconds and served immediately.

Remember, leftovers move through the rapid bacterial growth zone twice, once during cooling and once during reheating. The result is a low-quality and sometimes unsafe food.

Customer Leftovers

Any covered product served to customers that is bussed unopened and undamaged can be served again. Products should be inspected for damage. For example, no customer wants crackers that are partly crumbled.

All open foods left in the presence of customers must be thrown out. This includes butter, cheese, vegetables, dip, crackers, relish tray, etc. It also includes open jars of jam with spoons, which may be used at breakfast. Butter pats completely enclosed with plastic and foil can be reused. Butter pats that are on a piece of paper with a paper cover are not completely enclosed must not be reused. Uncovered bread left by customers should not be reused. The solution to preventing customer leftovers is to serve only the amount that customers can reasonably be expected to eat. Customers should be asked if they would like optional items such as coffee cream. Waiters / waitresses should bring more bread, butter, cream and dressing, etc., at customers' request.



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Emergency Procedures

Even the best-laid plans can go awry in the face of uncontrollable, unforeseen circumstances. Emergency situations such as flood, fire, tornado, blizzard, or power outage require the implementation of a well-rehearsed action plan to prevent further disaster.

In case of any of these potentially disastrous situations, the person in charge should contact the local regulatory authority immediately. The regulatory authority will then determine which foods are still safe to serve to the public. It may be that the emergency has resulted in direct contamination of the food or potentially hazardous products due to lack of proper holding or storage temperatures.

Sample Procedures

*In case of fire, burglary, or any life-threatening health conditions, dial **911**.*

***Choking.** If any individual is choking, assist the person by using the Heimlich Maneuver. (A poster should be displayed on the bulletin board.)*

***Power outage.** If the power outage is only 15 minutes, the facility will stay open. If the power outage is longer than 15 minutes, the facility will close. Customers with food will be allowed to finish their meals. Only those customers with complete service will be charged. Do not open refrigerators and freezers, or open as little as possible.*

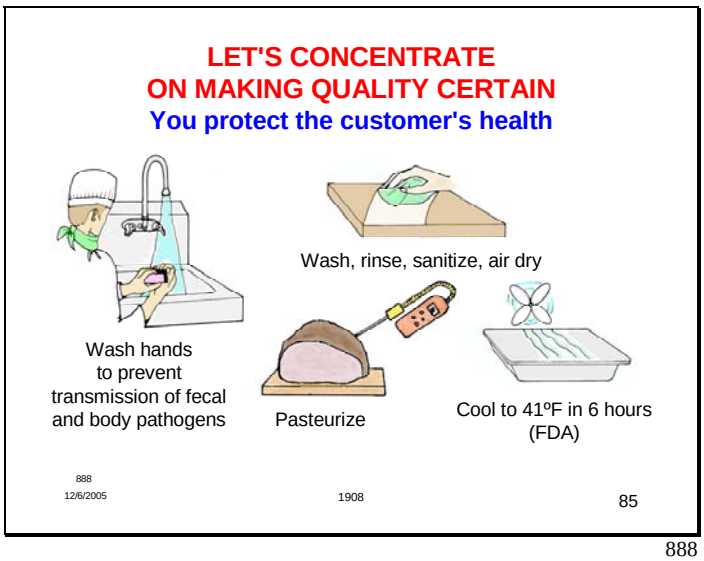
FDA Regulations

If the regular supply of potable water is interrupted, the foodservice establishment has two options, according to current FDA interpretation.

1. The establishment may temporarily close.
2. If the establishment remains open for business, it must obtain a temporary supply of potable water. Such a supply may be commercially bottled water; water obtained via a hose or piping from an adjacent, approved source (perhaps a nearby establishment that still has water); approved bulk water delivered in containers or by tanker; or from a stationary water tank filled from an approved source. These sources must be used not only for beverage water, but also for all preparation and cooking, ice making, and preparing of carbonated and other hot and cold beverages.

Hand washing and all cleaning and sanitizing must also be performed with alternate potable water. If necessary, save the potable water for hand washing and use single-service tableware. Garbage must be discarded with other refuse, not in garbage grinders or disposals. Employee toilets can be flushed with non-potable water or portable toilets may be used. Customer toilets and lavatories should be closed to prevent contamination. The regulatory agency must decide on a case-by-case basis what actions are most appropriate.

The policy manual should have a section for emergency plans that may be implemented in case of fire, robbery, and other serious emergencies. Safety of both employees and customers must not be jeopardized.



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HACCP Summary

Managers and employees can work together to assure that the food served in retail food operations is safe.

The goal of **Microbiological HACCP** is to control microorganisms, prevent their entry to food, and reduce their numbers on food through good purchasing and careful handling. The following list should be used to maintain microbiological HACCP.

- Wash hands and use a fingernail brush to prevent the transmission of fecal and body pathogens. Once hands are clean, do not touch the body with the hands.
- Prevent cross-contamination on cutting boards between raw and cooked or pasteurized foods such as meat, poultry, and fish, or food that will not be cooked such as celery, onions, and cheese for salads.
- Sanitize food contact surfaces between preparation of different food items.
- Purchase food from suppliers who certify the safety of the food or thoroughly pasteurize the food according to the following table.

FOOD PASTEURIZATION TABLE

Temp (°F)	Ground Meat, and Fish		Roast Beef		Shell Eggs, Other Raw meat and Fish, (not ground)	All Poultry
	5 D Kill (100,000:1 Calculated)	FDA Code	6.5 D Kill (3,160,000:1 Calculated)	FDA Code	FDA Code	FDA Code
130			112 min.	112 min.		
140	8.6 min.		11.2 min.	12 min		
145		3 min		4 min	15 sec.	
150	51.6 sec.	1 min	67 sec.	67 sec		
155	16 sec.	15 sec.				
160	5.2 sec.	<1 sec.	6.7 sec.	0		
165						15 sec.

- Heat food from 41 to 130°F in less than 6 hours (scientific research).
- Keep hot foods at 130°F (safety); 135°F (FDA Food Code compliance); 150°F (quality).
- Cool hot food from 135 to 70ºF in 2 hours, followed by further cooling to 41ºF, for a total time of 6 hours or less (FDA Food Code), or cool from 120 to 55°F, followed by continued cooling to 40°F (no time limit) (USDA Guidelines).
- To cool food rapidly, use shallow pan(s) with food depth of <2 inches or food in ≤1-gallon containers.
- Keep potentially hazardous cold food at 41°F or colder no longer than 7 days (FDA Food Code).
- Minimize or eliminate leftovers.
- Do not add fresh food to old food.

The goal of **Chemical HACCP** is to store and use chemicals properly and prevent chemical contamination by controlling their access to food. The following list should be used to achieve chemical HACCP.

- Keep chemicals in a separate room or cabinet.
- Set a strict policy for their use.
- Instruct employees how to use, measure, test, and store chemicals.

The goal of **Physical HACCP** is to control physical hazard contamination by setting and following policies for their control. The following list should be used to achieve physical (hard foreign object) HACCP

- Wear no jewelry in the production area.
- Allow no China coffee cups or glass beverage containers in the production area.
- Use no glass bottles, jars, or cans for food storage after initial use.
- Effectively restrain hair.
- Keep can openers dull to prevent shavings from entering the food.
- Account for all metal staples and nails from food packaging during opening.
- Keep opened food in labeled, dated, tightly covered approved food storage containers to prevent insect and rodent contamination.