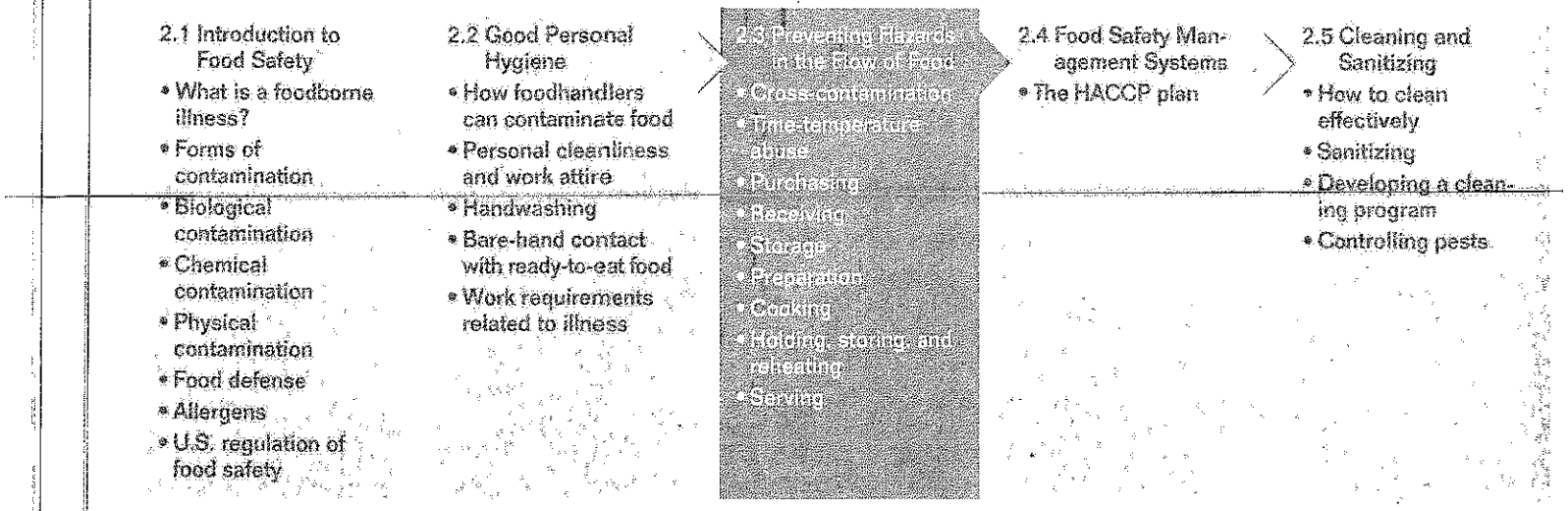


SECTION 2.3 PREVENTING HAZARDS IN THE FLOW OF FOOD

The flow of food begins well before the food is prepared for service. Responsibility for keeping food safe begins before a finished plate is presented to a customer. The steps that an operation takes to buy, store, prepare, cook, and serve food all pose risks to food safety. Understanding where contamination can happen in these steps and how to prevent it are critical tasks for restaurant and foodservice professionals.

Study Questions

After studying Section 2.3, you should be able to answer the following questions:

- What are the ways to prevent cross-contamination?
- How can time-temperature abuse be prevented?
- What are the different temperature measuring devices and their uses?
- What are the characteristics of an approved food source?
- What are the criteria for accepting or rejecting food during receiving?
- What are the proper procedures for storing food?
- What are the minimum internal temperature requirements for cooking various TCS foods?
- What are the proper procedures for holding, cooling, and reheating TCS food?
- How should food be handled for service?
- What are the proper procedures for preparing and serving food for off-site service?

Cross-Contamination

Think about the foodservice kitchens you have seen at school or in restaurants: lots of people and lots of food, all moving quickly. Pathogens can move around just as quickly in an operation. They can be spread from food or unwashed hands to prep areas, equipment, utensils, or other food. The spread of pathogens from one surface or food to another is called **cross-contamination**. It can happen at almost any point in the path that food takes in an operation. This path is known as the **flow of food**. It begins when you buy the food and ends when you serve it, as shown in Figure 2.19.

Figure 2.19: The flow of food.

When foodhandlers know how and when cross-contamination can happen in the flow of food, then they can prevent it. The most basic way to prevent cross-contamination is to separate raw food and ready-to-eat food. To do this, follow these guidelines:

- Make sure workstations, cutting boards, and utensils are clean and sanitized.
- Do not allow ready-to-eat food to touch surfaces that have come in contact with raw meat, seafood, or poultry.
- If using the same table to prepare many kinds of food, prepare raw meat, seafood, and poultry at a different time than ready-to-eat food. Be sure to clean and sanitize work surfaces and utensils between each product.

Time-Temperature Abuse

Most foodborne illnesses happen because TCS food has been **time-temperature abused**. Food has been time-temperature abused any time it remains at 41°F to 135°F. This is called the **temperature danger zone** because pathogens grow in this range. They grow especially fast in the middle of the range, between 70°F and 125°F.

Food is time-temperature abused any time it is cooked to the wrong internal temperature, held at the wrong temperature, or cooled or reheated incorrectly. Figure 2.20 shows food being measured for the correct temperature.

The longer food stays in the temperature danger zone, the more time pathogens have to grow. To keep food safe, reduce the time it spends in this temperature range. If food is held in this range for four or more hours, throw it out.

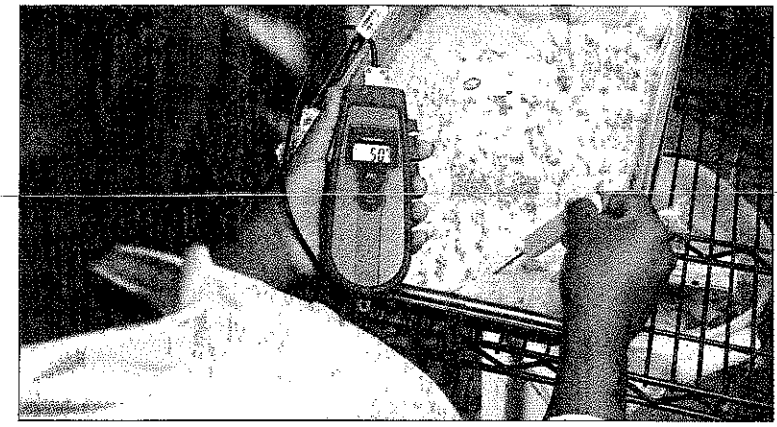


Figure 2.20: Food temperatures must be checked often. Food held in the temperature danger zone will grow pathogens.

Thermometers

The most important tool used to monitor temperature is the thermometer. Three types of thermometers are commonly used in operations—bimetallic-stemmed thermometers, thermocouples, and thermistors. The infrared thermometer, while not as common, is becoming more popular.

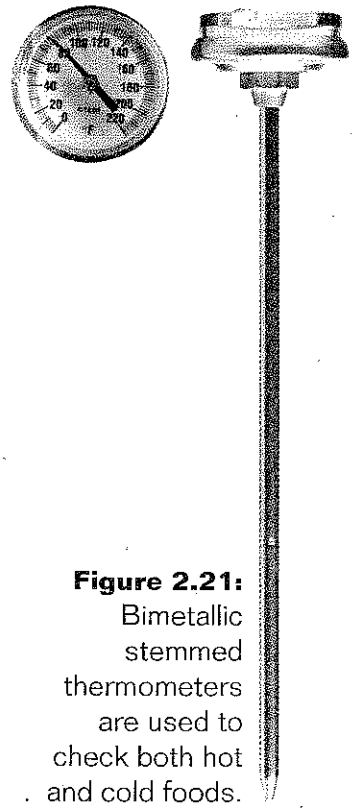


Figure 2.21: Bimetallic stemmed thermometers are used to check both hot and cold foods.

All of these tools will be effective only if foodhandlers follow specific guidelines for using them. Tools also have to be adjusted regularly, or **calibrated**, to keep them accurate.

Bimetallic Stemmed Thermometers

A **bimetallic stemmed thermometer** can check temperatures from 0°F to 220°F. This makes it useful for checking both hot and cold types of food. It measures temperature through its metal stem. When checking a temperature, insert the stem into the food up to the dimple, because the sensing area of the thermometer goes from the tip of the stem to the dimple. This trait makes the thermometer particularly useful for checking the temperature of large or thick food. It is usually not practical for thin food such as hamburger patties. Adjust this thermometer by using its calibration nut. Figure 2.21 shows a bimetallic stemmed thermometer.

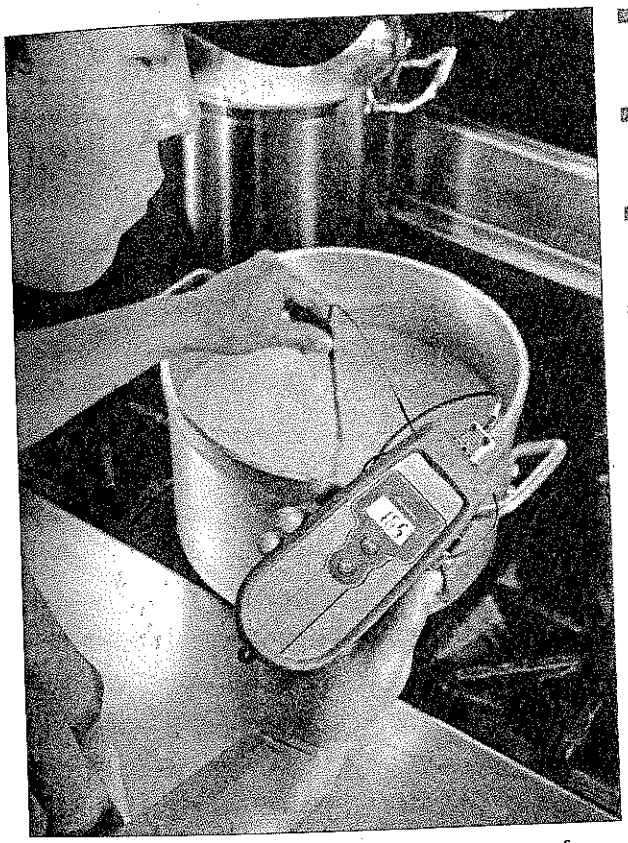
Thermocouples and Thermistors

Thermocouples and **thermistors** are also common in restaurant and foodservice operations. They measure temperatures through a metal probe and display them digitally. The sensing area on

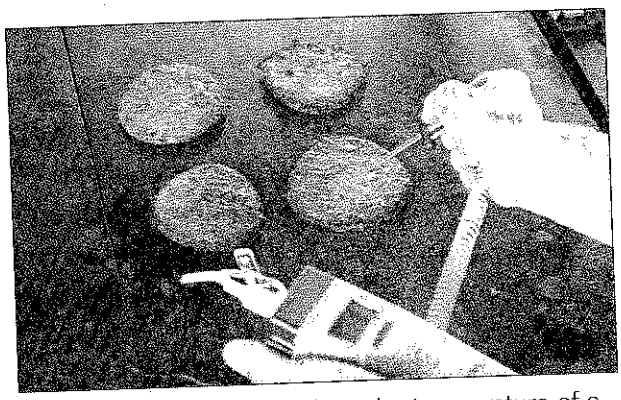
thermocouples and thermistors is on the tip of the probe. This means they don't have to be inserted into the food as far as bimetallic stemmed thermometers to get a correct reading, making them good for checking the temperature of both thick and thin foods.

Thermocouples and thermistors come in several styles and sizes, with different types of probes. Figure 2.22 shows the types of temperature probes:

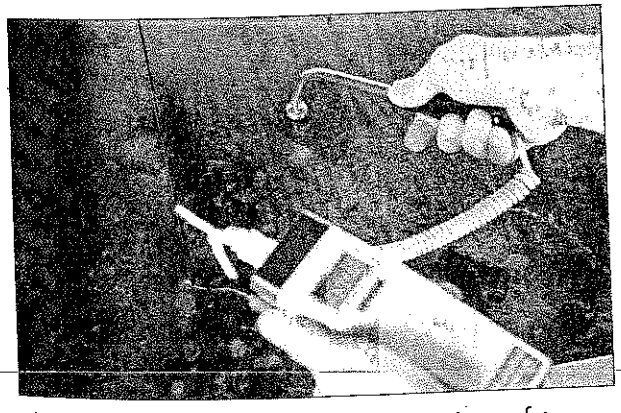
- Immersion probes check the temperature of liquids.
- Surface probes check the temperature of flat cooking equipment, such as a griddle.
- Penetration probes are useful for checking the internal temperature of thin food.
- Air probes check the temperature inside refrigerators and ovens.



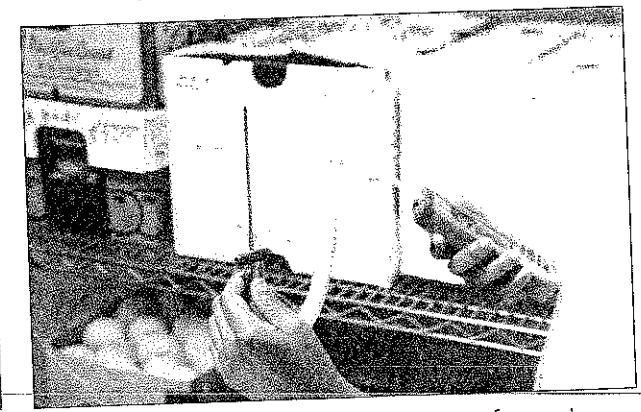
1) Immersion probe checking the temperature of soup.



3) Penetration probe checking the temperature of a hamburger.



2) Surface probe checking the temperature of a griddle.



4) Air probe checking the temperature of a cooler.

Figure 2.22: The four types of temperature probes.

Infrared Thermometers

Infrared thermometers measure the temperatures of food and equipment surfaces. These thermometers are quick and easy to use. Infrared thermometers do not need to touch a surface to check its temperature, so there is less chance for cross-contamination and damage to food. However, these thermometers cannot measure air temperature or the internal temperature of food. Figure 2.23 shows an infrared thermometer.

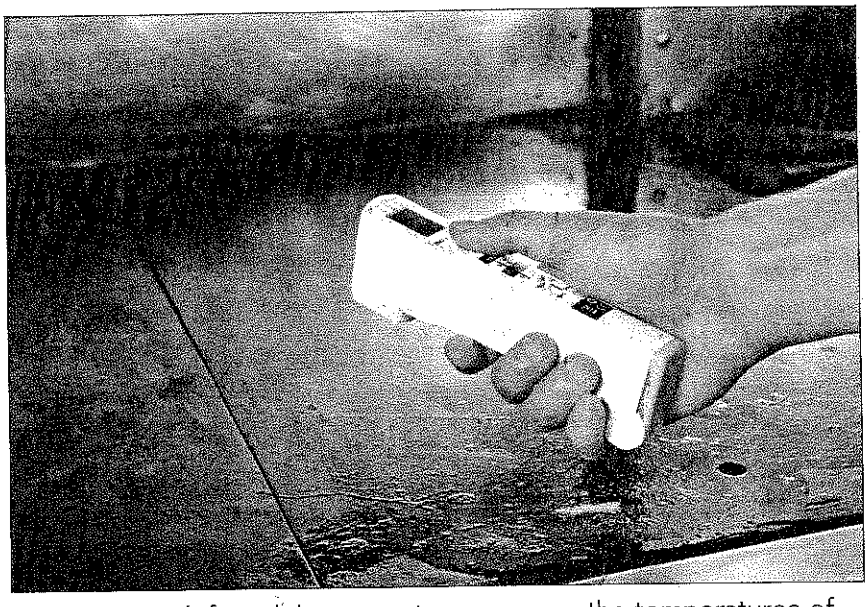


Figure 2.23: Infrared thermometers measure the temperatures of both food and equipment.

Purchasing

All the food used in a restaurant or foodservice operation should come from approved, reputable suppliers. An approved food supplier is one that has been inspected by appropriate agencies and meets all applicable local, state, and federal laws. Restaurant and foodservice purchasers must make sure that their suppliers use good food safety practices. This applies to all suppliers along the supply chain, whether a local farmer or a large-sized corporation. An operation's supply chain can include growers, shippers, packers, manufacturers, distributors (trucking fleets and warehouses), and/or local markets.

Receiving

To keep food safe during receiving, an operation needs to have enough trained staff available to receive, inspect, and store the food. Deliveries should be carefully

and immediately inspected and then put away quickly. Follow the guidelines reviewed below when deciding if an item should be accepted or rejected.

Temperatures

Use thermometers to check food temperatures during receiving. Figure 2.24 shows how to check the temperature of various foods.

Deliveries of cold TCS food should be 41°F or lower, unless otherwise specified by the manufacturer. Deliveries of hot TCS food should be 135°F or higher. Frozen food should be frozen. Reject any frozen food that has ice crystals on the product or packaging. (This means the product may have thawed and refrozen.) You should also reject the food if any fluids or frozen liquids appear in the bottom of its case.

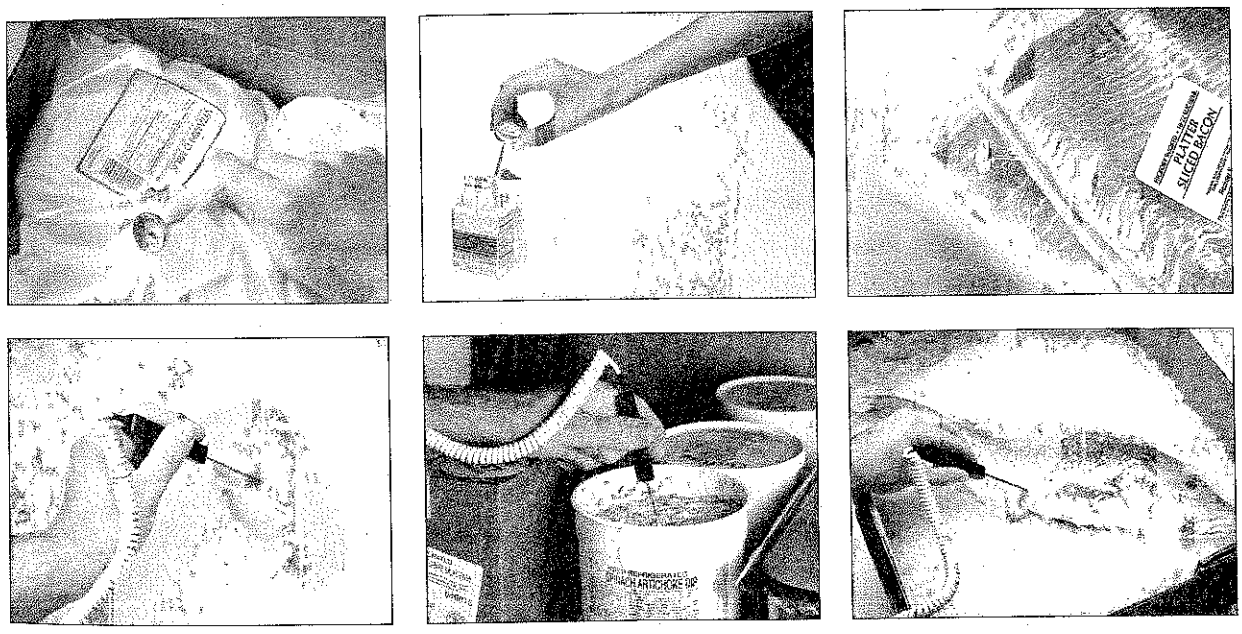


Figure 2.24: Checking the temperature of various types of food.

Packaging

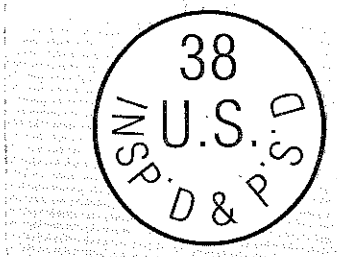
The packaging of food and nonfood items should be intact and clean. Reject any items with packaging problems, such as tears, holes, punctures, leaks, dampness, or water stains. You should also reject any items with signs of pest damage or expired use-by dates.

Meat, poultry, and eggs should also have an inspection stamp on their packaging. See Figure 2.25. The stamps prove that the items meet the safety standards of the U.S. Department of Agriculture (USDA) or a state department of agriculture.

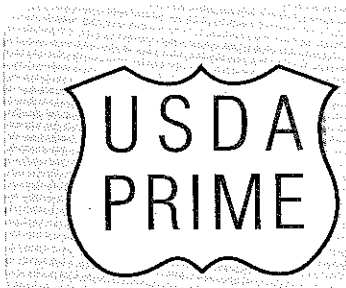
Figure 2.25: Checking for inspection stamps is a way to make sure food is coming from an approved source. The inspection stamps for meat and poultry are mandatory.

Inspection and Grading Stamps for Meat

USDA Inspection Stamp

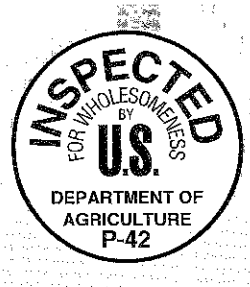


USDA Grading Stamp



Inspection and Grading Stamps for Poultry

USDA Inspection Stamp



USDA Grading Stamp

Product Quality

Poor food quality is sometimes a sign of time-temperature abuse. Reject food if it has any of these problems:

- Abnormal color (for example, fresh fish should not have dark spots or discoloration)
- Slimy, sticky, or dry texture
- Soft flesh that leaves an imprint when you touch it
- Abnormal or unpleasant odor (for example, fish that smells like ammonia)

Some products have additional specific guidelines for receiving.

Shellfish

Shellfish can be received either shucked or live. Make sure that raw shucked shellfish are packaged in containers for one-time use only. Containers must be labeled with the packer's name, address, and certification number. Containers one-half gallon (1.9 L) or smaller must have either a "best if used by" or "sell by" date. Containers larger than one-half gallon (1.9 L) must have the date the shellfish were shucked.

Live shellfish must be received with shellstock identification tags. These tags must remain attached to the delivery container until all of the shellfish have been used. Employees must write on the tags the date that the last shellfish was sold or served from the container. Operators must keep these tags on file for 90 days from the date written on them. Reject shellfish if they are very muddy, have broken shells, or are dead.

Eggs

Eggs must be clean and unbroken when you receive them. Reject eggs if they do not meet the following guidelines:

- Shell eggs must be received at an air temperature of 45°F or lower.
- Liquid, frozen, and dehydrated egg products must be pasteurized and have a USDA inspection mark.
- Eggs also must meet USDA grade standards. See Figure 2.26.

Grading and Inspection Stamps for Eggs

USDA Inspection Stamp

USDA Grading Stamp

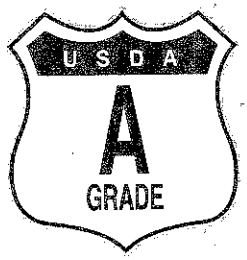


Figure 2.26: These are grading and inspection stamps for eggs.

Milk and Dairy Products

Milk and dairy products must be received at 41°F or lower unless otherwise specified by law. They also must be pasteurized and meet FDA Grade A standards.

Storage

Food can become unsafe if stored improperly. Store all TCS food at 41°F or lower, or at 135°F or higher. Monitor food temperatures regularly.

Label all ready-to-eat TCS food that is prepped in-house if it will be held for longer than 24 hours. The label must include the name of the food and the date by which it should be sold, eaten, or thrown out. Store ready-to-eat TCS food that has been prepped in-house for a maximum of seven days at 41°F or lower. Throw it out after seven days.

Rotate food in storage to use the oldest inventory first. Many operations use the **first-in, first-out (FIFO) method** to rotate refrigerated, frozen, and dry food

during storage. Here is one way to use the FIFO method:

1. Identify the food item's use-by or expiration date, which is usually somewhere on the packaging, as shown in Figure 2.27.
2. Store items with the earliest use-by or expiration dates in front of items with later dates.
3. Once shelved, use those items stored in front first.

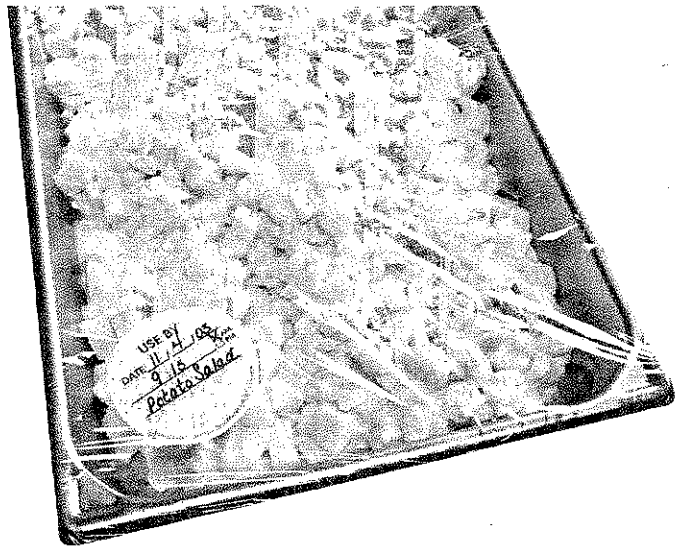


Figure 2.27: Rotate food using the FIFO method: first-in, first-out.

Preventing Cross-Contamination

Always store food to prevent cross-contamination. Wrap or cover food. Store refrigerated raw meat, poultry, and seafood separately from ready-to-eat food. If raw and ready-to-eat food cannot be stored separately, store ready-to-eat food above raw meat, poultry, and seafood. This will prevent juices from raw food from dripping onto ready-to-eat food.

Store raw meat, poultry, and seafood in coolers in the following top-to-bottom order:

1. Seafood (top)
2. Whole cuts of beef and pork
3. Ground meat and ground fish
4. Whole and ground poultry (bottom)

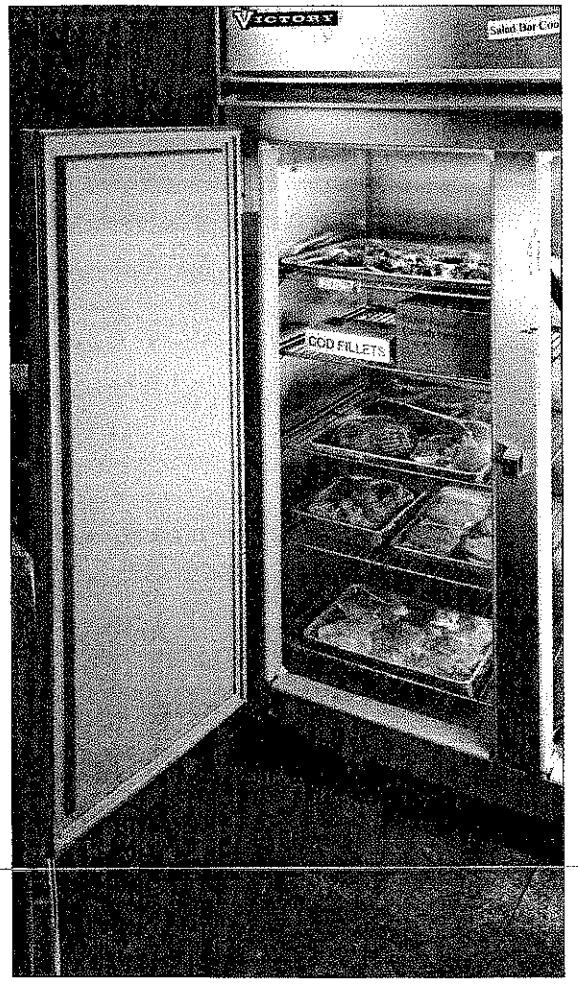


Figure 2.28: Store food in coolers in the correct top-to-bottom order.

This order is based on the minimum internal cooking temperature of each food. Meat cooked to higher temperatures is always stored beneath meat cooked to lower temperatures. Figure 2.28 on the previous page shows how to properly store foods in a cooler.

Do not overload coolers or freezers. Storing too many food items prevents good airflow and makes the units work harder to stay cold. Similarly, do not line cooler or freezer shelves with aluminum foil. This blocks the circulation of cold air.

Preparation

Time-temperature abuse can easily happen during preparation. To avoid time-temperature abuse, remove from the refrigerator only as much food as can be prepared in a short period of time. Prepare food in small batches so that ingredients don't sit out for too long in the temperature danger zone.

When thawing food before preparation, it's important to remember that freezing doesn't kill pathogens. When frozen food is thawed and exposed to the temperature danger zone, any pathogens in the food will begin to grow. To reduce this growth, never thaw food at room temperature. Thaw TCS food in one of these ways:

- Thaw food in a cooler, at a product temperature of 41°F or lower.
- Submerge food under running water at 70°F or lower. Make sure the water is potable—safe to drink.
- Thaw food in a microwave oven if it will be cooked immediately after thawing.
- Thaw food as part of the cooking process.

Figure 2.29 illustrates the acceptable methods for thawing food.

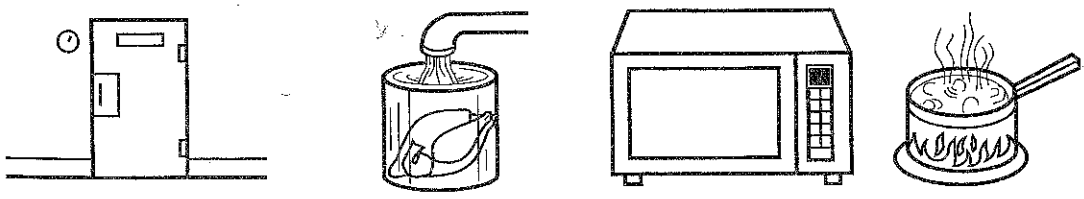


Figure 2.29: Acceptable methods for thawing food.

Cooking

Cooking food to the correct temperature is critical for keeping it safe. Each type of food has a minimum internal temperature that it must reach. Once food reaches its minimum internal temperature, make sure that it stays at that temperature for a specific amount of time. Figure 2.30 shows the correct way to check temperature.

Table 2.4 identifies the minimum internal temperatures and times for specific types of food.

Operations that primarily serve high-risk populations, such as nursing homes and day-care centers, cannot serve certain items—for example, raw seed sprouts, raw or undercooked eggs (such as over-easy eggs), raw or undercooked meat (such as rare hamburgers), or seafood.

Food Facts

Did You Know...?

Since 1995, 13 foodborne-illness outbreaks worldwide have been linked to sprouts. These outbreaks sickened 956 people and resulted in one death.

Source: www.healthnews.com

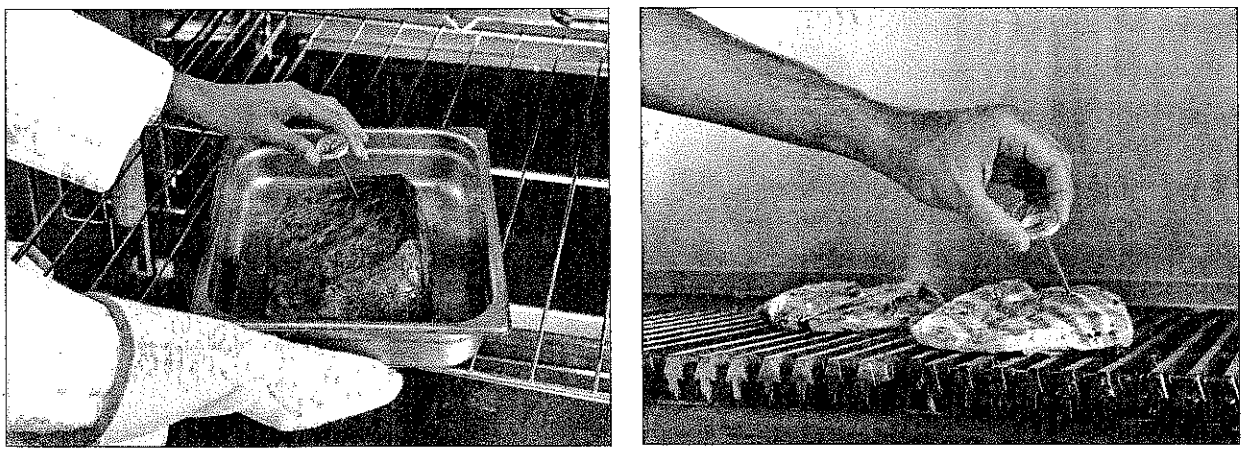


Figure 2.30: To check food temperature correctly: 1) Pick a thermometer with a probe that is the right size for the food. 2) Check the temperature in the thickest part of the food. Take at least two readings in different locations.

Table 2.4: Cooking Requirements for Specific Types of Food

Minimum Internal Temperature	Type of Food
165°F for 15 seconds	Poultry—including whole or ground chicken, turkey, or duck Stuffing made with TCS ingredients Stuffed meat, seafood, poultry, or pasta Dishes that include previously cooked TCS ingredients (raw ingredients should be cooked to their minimum internal temperatures)
155°F for 15 seconds	Ground meat—including beef, pork, and other meat Injected meat—including brined ham and flavor-injected roasts Ground seafood—including chopped or minced seafood Eggs that will be hot-held for service
145°F for 15 seconds	Seafood—including fish, shellfish, and crustaceans Steaks/chops of pork, beef, veal, and lamb Eggs that will be served immediately
145°F for 4 minutes	Roasts of pork, beef, veal, and lamb
135°F	Commercially processed, ready-to-eat food that will be hot-held for service (cheese sticks, deep-fried vegetables)
135°F	Fruit, vegetables, grains (rice, pasta, etc.), and legumes (such as beans, refried beans) that will be hot-held for service

Information

Start the Water Boiling Before You Harvest the Corn!

Careless food-handling can actually decrease the nutrient content of food. Nutrient profiles can be affected by staleness or improper storage. Farm-fresh corn on the cob is one example. The sooner it is cooked and eaten, the higher the sugar content. As the corn ages in transport and storage, sugar converts to starch.

This alters not only the flavor, but also the way a body metabolizes the corn after it is eaten. Sweet-tasting, simple CHO (carbohydrate) molecules are rather quickly cleaved and enter the bloodstream as glucose, raising blood sugar. They are then transported into the cells via insulin. Not-so-sweet starch is a complex CHO, which cleaves more slowly and distributes the glucose to the blood and cells over a longer time frame. The increase in blood sugar is not as dramatic.

Both simple and complex carbohydrates definitely play a role in healthy eating, and you need some of both. Too many simple CHOs are bad, of course. But that doesn't mean you want to eat bland, starchy corn instead of fresh, sweet corn. Get simple CHOs through yummy high-fiber corn, rather than through something with fewer additional nutritional benefits.

Holding, Cooling, and Reheating

If foodhandlers aren't serving cooked food immediately, they must keep it out of the temperature danger zone. This means cooling the food quickly, reheating it correctly, and/or holding it correctly.

Holding

To hold TCS food safely, hold hot food at 135°F or higher and hold cold food at 41°F or lower. Be sure to check temperatures at least every four hours. Throw out any food that's in the temperature danger zone. Figure 2.31 shows the proper way to hold hot food.

Essential Skills
Holding Foods

- Hold hot food at 135°F or higher.
- Hold cold food at 41°F or lower.
- Check temperatures at least every four hours. Throw out any food that's in the temperature danger zone.
- Do not use hot-holding equipment to reheat food if it is not designed to do so.

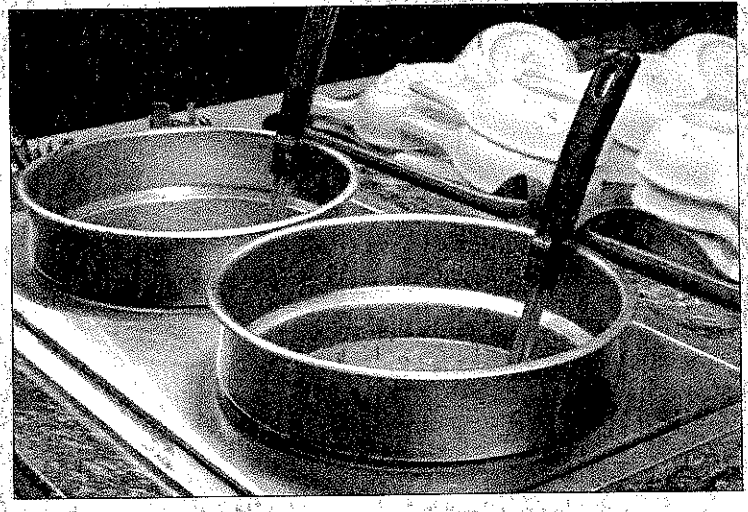


Figure 2.31: Hold hot food at 135°F or higher.

Infrared is a frequency of radiation waves of the electromagnetic spectrum, and **radiation** is simply the transfer of energy without physical contact. Infrared is just beyond the wavelength of the visible color red. This means that the waves are always all around you, whether you can detect them or not. Infrared waves play a role in culinary technology. One example is the culinary laser thermometer that uses infrared technology to quickly measure the surface temperature of hot pans.

The transfer of heat from something hot to something cold is really the flow of energy from a source of high energy to a lower energy material. When ice melts, waves of energy bombard the surface of the ice and cause the water molecules to move faster, which makes them liquid again. Temperature is really just molecular speed. When hot food is quickly cooled for storage, the hot food is actually transferring energy in the form of heat away from the product to something else (like a cooling paddle). You don't add cold, you remove heat. Thanks to radiation, materials do not have to be touching to transfer heat.

Figure 2.32 shows dishes under an infrared light, waiting to be served.

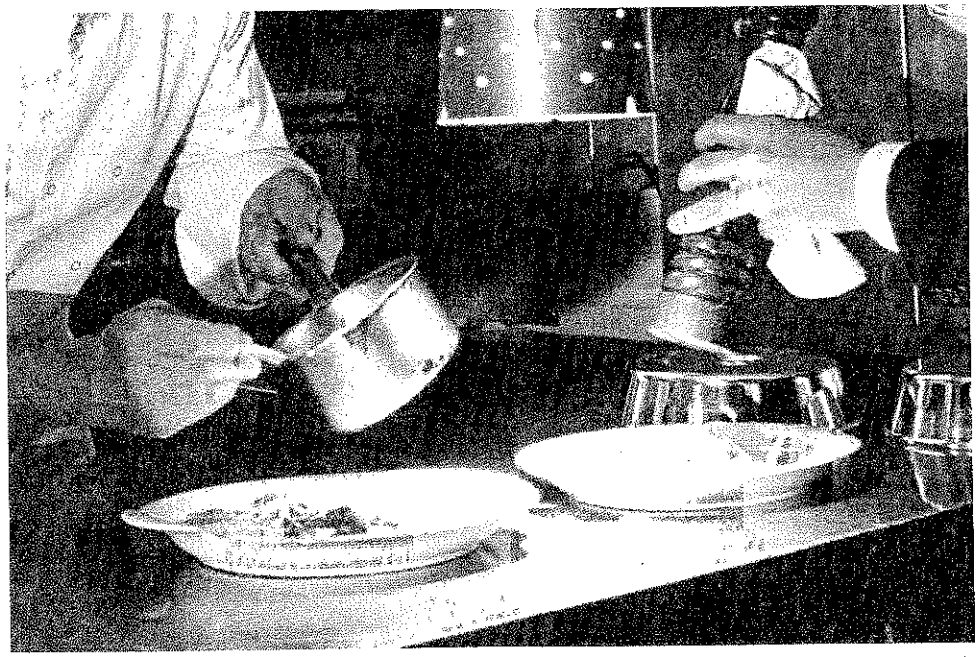


Figure 2.32: The chef is holding food under an infrared light until it is served.

Cooling

Remember, pathogens grow well in the temperature danger zone. And they grow much faster at temperatures between 125°F and 70°F.

Cool TCS food from 135°F to 41°F or lower within six hours. First, cool food from 135°F to 70°F within two hours. Then cool it to 41°F or lower in the next four hours. Figure 2.33 explains how to properly cool TCS foods.

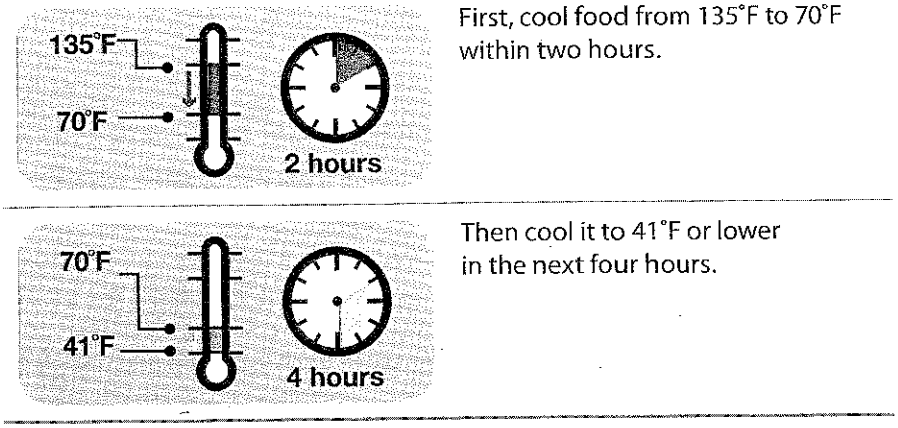
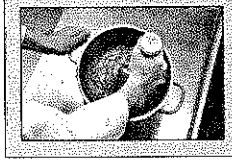


Figure 2.33: Cool TCS foods from 135°F to 41°F or lower within six hours.

If food hasn't reached 70°F within two hours, it must be either thrown out or reheated and then cooled again. Table 2.5 outlines how to cool food quickly and safely.

Table 2.5: Cooling Food Quickly and Safely

	Reduce the size of food into smaller amounts by either cutting large food items into smaller pieces or dividing large containers of food into smaller containers or shallow containers.
	Place small containers into a prep sink or a large pot filled with ice water. This is called an ice-water bath. Stir the food frequently to cool it faster and more evenly.
	Use ice paddles to stir food. Ice paddles are plastic paddles that can be filled with ice or with water and then frozen. Food stirred with these paddles cools quickly.

Reheating

If foodhandlers plan to reheat leftover or previously prepared TCS food so that it can be held for service, they must heat the food to an internal temperature of 165°F. The food needs to go from storage temperature to 165°F within two hours and then stay at that temperature for 15 seconds. If it doesn't reach this temperature, throw the food out.

If the food is going to be reheated for immediate service, just reheat it to an appropriate serving temperature.

Did You Know...?

Doggy bags are containers of food that are left over from a meal that the customer has chosen to take home. Most of the time, the food is taken away while it is in the temperature danger zone, where bacteria that causes foodborne illnesses grows well. To minimize risk of foodborne illness, restaurant staff should transfer the food (leftovers) into a new, unused, food-grade container, and they should remind the customer to store the food according to food safety guidelines.

Serving

The biggest threat to food that is ready to be served is contamination. Kitchen and service employees must know how to serve food in ways that keep it safe.

The kitchen staff must follow the guidelines below:

- Handle ready-to-eat food with tongs, deli sheets, or gloves.
- Use separate utensils for each food item. Clean and sanitize them after each serving task.
- Store serving utensils in the food with the handle extended above the rim of the container, to prevent anyone accidentally touching the food while they try to retrieve the utensil, which might contaminate the food. Alternatively, place utensils on a clean and sanitized food-contact surface.

The service staff needs to be just as careful as the kitchen staff. They can contaminate food by handling the food-contact areas of glasses, utensils, and dishes. Figure 2.34 shows guidelines for service staff when serving food.

Off-Site Foodservice

Any delay between preparation and service increases the threat to food safety. Food that will be served off-site has a greater risk of time-temperature abuse and contamination. Figure 2.35 shows an example of an insulated food container that keeps food at the proper temperature during holding, transporting, and catering.

There are specific procedures to keep food for off-site service safe:

- Pack food in insulated food containers that can keep food out of the temperature danger zone. Use only food-grade containers that won't mix, leak, or spill food.
- Check internal food temperatures regularly.
- Clean the inside of delivery vehicles regularly.


Hold dishes by the bottom or edge.

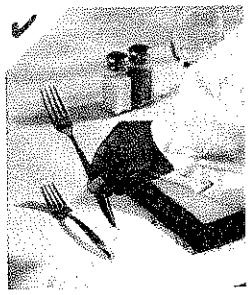
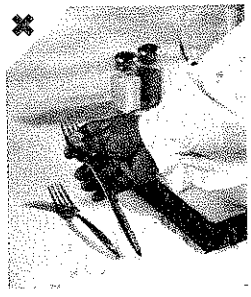
Hold glasses by the middle, bottom, or stem.

Do **NOT** touch the food-contact areas of dishes or glassware.


Carry glasses in a rack or on a tray to avoid touching the food-contact surfaces.

Stacking china and glassware can cause them to chip and break.

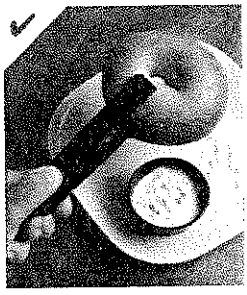
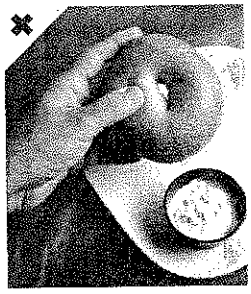
Do **NOT** stack glasses when carrying them.

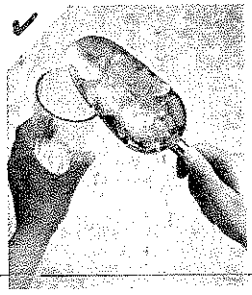
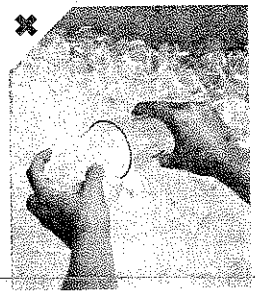
Hold flatware by the handle.

Store flatware so servers grasp handles, not food-contact surfaces.

Do **NOT** hold flatware by food-contact surfaces.

Minimize bare-hand contact with food that is ready to eat.

Use ice scoops or tongs to get ice.

NEVER scoop ice with your bare hands or a glass. A glass may chip or break.

Figure 2.34: Service staff should use these guidelines when serving food.

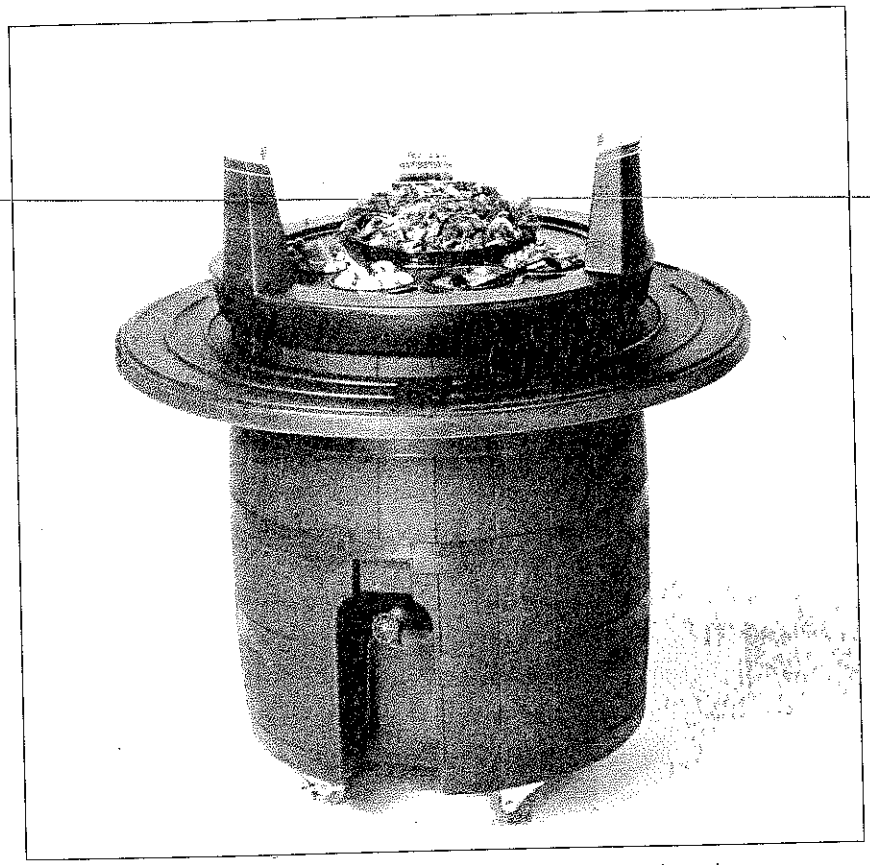


Figure 2.35: Food should be held and transported at the proper temperature using insulated equipment.

Summary

In this section, you learned the following:

- Cross-contamination can be prevented by making sure workstations, cutting boards, and utensils are clean and sanitized; not allowing ready-to-eat food to touch surfaces that have come in contact with raw meat, seafood, or poultry; preparing different kinds of foods at different times; and cleaning and sanitizing work surfaces and utensils between each product.
- To prevent time-temperature abuse, minimize the amount of time that food spends in the temperature danger zone.
- Three types of thermometers commonly used in operations are bimetallic stemmed thermometers, thermocouples, and thermistors. In addition, infrared thermometers use infrared technology to produce accurate external temperature readings of food and equipment surfaces.
- An approved food source (supplier) is one that has been inspected and meets all applicable local, state, and federal laws.

- The criteria for accepting or rejecting food during receiving are as follows:
  - **Temperature:** Cold TCS should be 41°F or lower, hot TCS should be 135°F or higher, and frozen food should be frozen. Reject any frozen food that has ice crystals on the product or packaging or if any fluids or frozen liquids appear in the bottom of its case.
  - **Packaging:** For both food and nonfood items, packaging should be intact and clean. Reject any item that has a package with tears, holes, punctures, leaks, dampness, water stains, signs of pest damage, or an expired use-by date.
  - **Product quality:** Reject any food that has an abnormal color, slimy or sticky texture, soft flesh that leaves an imprint when you touch it, or abnormal or unpleasant odor.
  - **Shellfish:** Raw, shucked shellfish are packaged in containers for one-time use only. Containers must be labeled with the packer's name, address, and certification number. Live shellfish must be received with identification tags. Employees must write on the tags the date that the last shellfish was sold or served from the container, and keep the tags as records. Reject shellfish if they are muddy, have broken shells, or are dead.
  - **Eggs:** Shell eggs must be clean and unbroken. Reject shell eggs received at an air temperature higher than 45°F.
  - **Milk and dairy products:** These products must be received at 41°F or lower unless otherwise specified. They must be pasteurized and meet FDA Grade A standards.
- All TCS foods must be stored at 41°F or lower or at 135°F or higher. Label all ready-to-eat TCS food prepped in-house that will be held for more than 24 hours. These foods can be stored in-house for a maximum of seven days at 41°F or lower. Rotate food to use the oldest inventory first, and wrap or cover food. Refrigerate raw meat, poultry, and seafood separately from ready-to-eat food. Store raw meat, poultry, and seafood in coolers in the following top-to-bottom order: seafood on top, then whole cuts of beef and pork, then ground meat and ground fish, and at the bottom, whole and ground poultry.
- The following are minimum internal temperature requirements for cooking TCS foods:
  - **165°F for 15 seconds:** Poultry, stuffing made with TCS ingredients, stuffed meat/seafood/poultry/pasta, dishes that include previously cooked TCS ingredients
  - **155°F for 15 seconds:** Ground meat, injected meat, ground seafood, eggs that will be hot-held for service

- **145°F for 15 seconds:** Seafood, including fish, shellfish, and crustaceans; steaks/chops of pork, veal, and lamb; eggs that will be served immediately
- **145°F for 4 minutes:** Roasts of pork, beef, veal, and lamb
- **135°F:** Commercially processed ready-to-eat food that will be hot-held for service; fruits, vegetables, grains, and legumes that will be hot-held for service

- Hold hot TCS food at 135°F or higher, and hold cold TCS food at 41°F or lower. Cool TCS food from 135°F to 41°F or lower within six hours—135°F to 70°F within the first two hours, and then to 41°F or lower in the next four hours.
- Reheat TCS food for hot-holding by heating it from storage temperature to an internal temperature of 165°F in less than two hours. Then make sure that the food stays at that temperature for 15 seconds.
- Kitchen staff should handle ready-to-eat food with tongs, deli sheets, or gloves; use separate utensils for each item; clean and sanitize after each serving task; and store serving utensils in the food with the handle extended above the rim of the container. The service staff should hold dishes by the bottom or edge; hold glasses by the middle, bottom, or stem; carry glasses in a rack or on a tray; hold flatware by the handle; store flatware so servers grasp handles; minimize bare-hand contact with ready-to-eat food; and use ice scoops or tongs to get ice.
- Food prepared and served off-site must be packed in insulated food containers and checked for internal food temperature regularly. The vehicle used to transport food must be clean.

Section 2.3 Review Questions

1. Explain the FIFO method of stock rotation.
2. What is the minimum internal temperature for the following foods?
   a. Veal
   b. Rice that will be hot-held for service
   c. Seafood
   d. Ground meat
   e. Poultry
3. Describe the process for cooling food quickly and safely. Identify ways you can help to cool food more quickly.
4. Compare the different types of thermometers used to measure the temperature of food.
5. What factors are most important to Melisa Bouchard as she works to improve safety in the flow of food?
6. At the Uptown Grille, Brian received the order from FoodCorp International. As he stored the food, what should he have checked? Did you notice any "red flags"?
7. What would happen if there were a major power outage in your area? Could this be a threat to a restaurant or foodservice operation? How? What could be done to protect the operation?
8. Where in the flow of food do you think cross-contamination is most likely to occur? Why?

Section 2.3 Activities

1. Study Skills/Group Activity: Safeguarding the Flow of Food

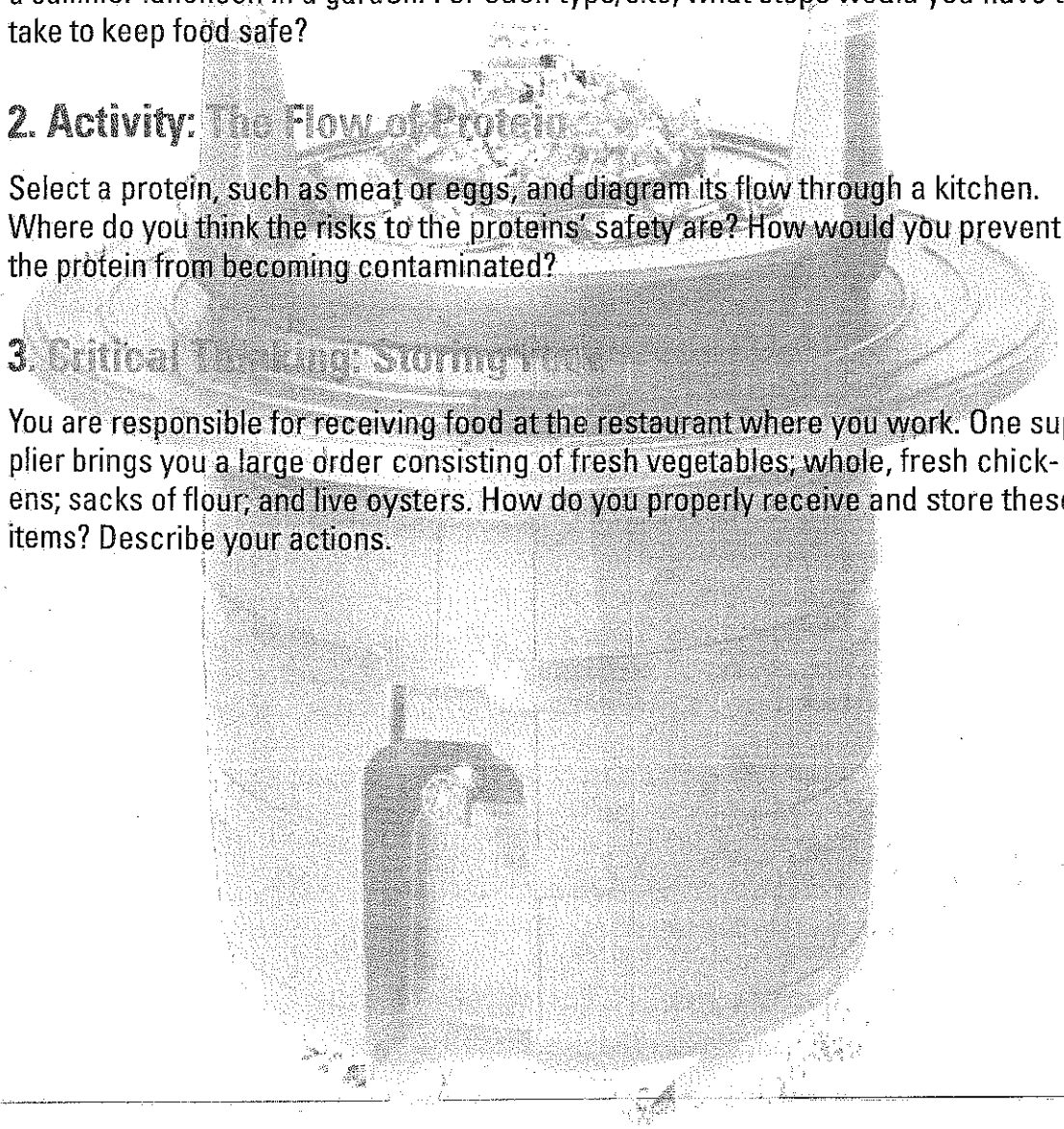
As a group, brainstorm three types of off-site foodservice—for example, catering an event at a banquet hall versus catering a beachside clambake versus catering a summer luncheon in a garden. For each type/site, what steps would you have to take to keep food safe?

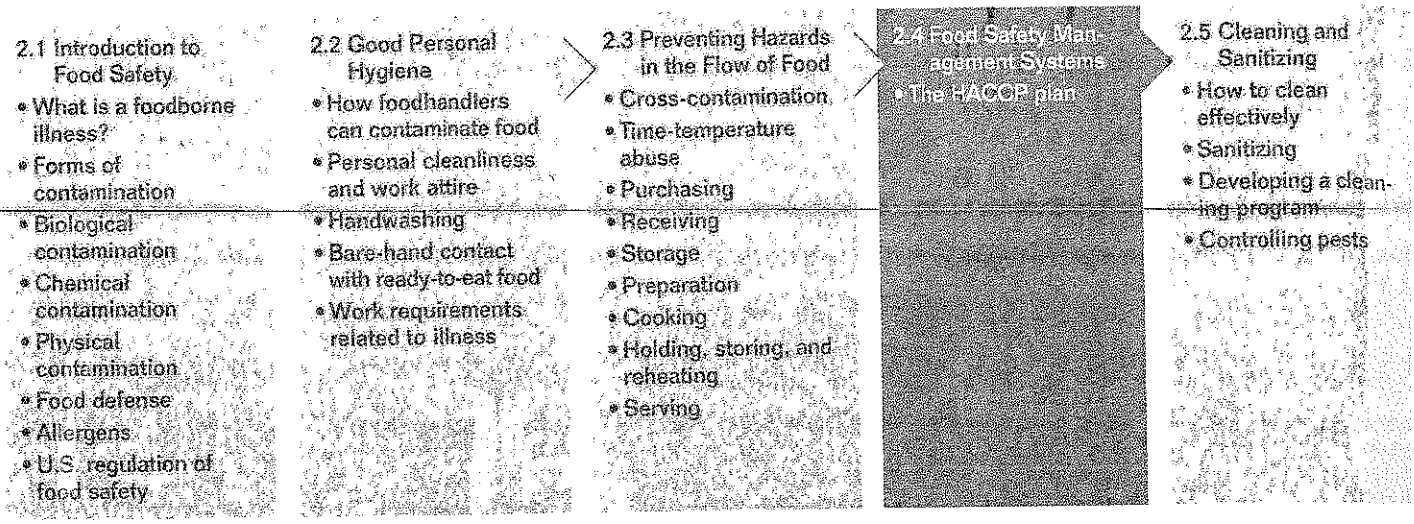
2. Activity: The Flow of Protein

Select a protein, such as meat or eggs, and diagram its flow through a kitchen. Where do you think the risks to the proteins' safety are? How would you prevent the protein from becoming contaminated?

3. Critical Thinking: Storing Wisely

You are responsible for receiving food at the restaurant where you work. One supplier brings you a large order consisting of fresh vegetables; whole, fresh chickens; sacks of flour; and live oysters. How do you properly receive and store these items? Describe your actions.





SECTION 2.4 FOOD SAFETY MANAGEMENT SYSTEMS

In the earlier sections, you learned how to handle food safely throughout the flow of food. The next step in preventing foodborne illness is the development of a food safety management system. One such system is a Hazard Analysis Critical Control Point system, or HACCP.

Study Questions

After studying Section 2.4, you should be able to answer the following questions:

- What are the HACCP principles?
- Why are the HACCP principles important?

The HACCP Plan

One of the best ways for restaurant and foodservice managers to prevent foodborne illness is to develop and follow a food safety management system. A **food safety management system** is a group of procedures and practices that work together to prevent foodborne illness. Combined, these procedures and practices control risks and hazards throughout the flow of food in an operation.

A **Hazard Analysis Critical Control Point,** or **HACCP** (HASS-ip), system is an example of a food safety management system. HACCP identifies major hazards at specific points within a food's flow through the operation. The idea is that if managers can figure out where a biological, chemical, or physical hazard might happen, then they can prevent, eliminate, or reduce it.

An effective HACCP system is based upon a written plan that considers an operation's menu, customers, equipment, processes, and operations. Because there are so many variables, each HACCP plan is unique. A plan that works for one operation might not work for another.

HACCP Principles

A HACCP plan is based on seven basic principles. Each HACCP principle builds on the information gained from the previous principle. Consider all seven principles, in order, when developing a plan:

1. Conduct a hazard analysis.
2. Determine critical control points (CCPs).
3. Establish critical limits.
4. Establish monitoring procedures.
5. Identify corrective actions.
6. Verify that the system works.
7. Establish procedures for record keeping and documentation.

In general terms, the principles break into three groups:

- Principles 1 and 2 help identify and evaluate hazards.
- Principles 3, 4, and 5 help establish ways for controlling those hazards.
- Principles 6 and 7 help maintain the HACCP plan and system, and verify its effectiveness.

Principle 1: Conduct a Hazard Analysis

First, look for the potential hazards in the food an operation serves. These hazards might be physical, chemical, or biological.

A good place to begin looking for hazards is to see how food on the menu is processed in the operation. Many types of food are processed in similar ways. For example, both salads and cold sandwiches are usually prepared and served without any cooking. Next, identify any TCS food in these items. Then determine where any food safety hazards are most likely to happen for each TCS food. Figure 2.36 on page 129 shows Principles 1, 2, and 3 in action.

Principle in Action

The management team at Enrico's Italian Restaurant decides to create a HACCP program. They begin by analyzing their hazards.

The team members note that many of the ingredients for their dishes are received, stored, prepared, cooked, and served the same day. The most popular of these items is the spicy charbroiled chicken breast.

The team determines that bacteria are the most likely hazard for food prepared this way.

Principle 2: Determine Critical Control Points (CCPs)

Find the points in the process where the identified hazard(s) can be prevented, eliminated, or reduced to safe levels. These are the **critical control points (CCPs).** Depending on the menu item, there may be more than one CCP.

Principle in Action

Enrico's management identifies cooking as the CCP for food that is prepared and cooked for immediate service. This includes the chicken breasts.

These food items must be handled safely throughout the flow of food. However, proper cooking is the only step that will eliminate or reduce bacteria to safe levels.

Because the chicken breasts are prepared for immediate service, cooking was the only CCP identified.

Principle 3: Establish Critical Limits

For each CCP you have identified, determine its critical limit. A critical limit is a requirement, such as a temperature requirement, that must be met to prevent, eliminate, or reduce a hazard. Make sure a critical limit is very specific and clearly written. Ideally, the limit should state a requirement and a preferred method for achieving that requirement. Figure 2.37 on page 130 illustrates Principles 4, 5, and 6.

Principle in Action

A critical limit is needed for the cooking CCP for the chicken breasts. Management decides that the critical limit will be cooking the chicken to a minimum internal temperature of 165°F for 15 seconds.

Team members determine that the critical limit can be met by cooking the chicken breasts in the broiler for 16 minutes.

Principle 4: Establish Monitoring Procedures

Determine the best way for your operation to check to make sure critical limits are being met. Make sure the limits are consistently met. Identify who will monitor them and how often.

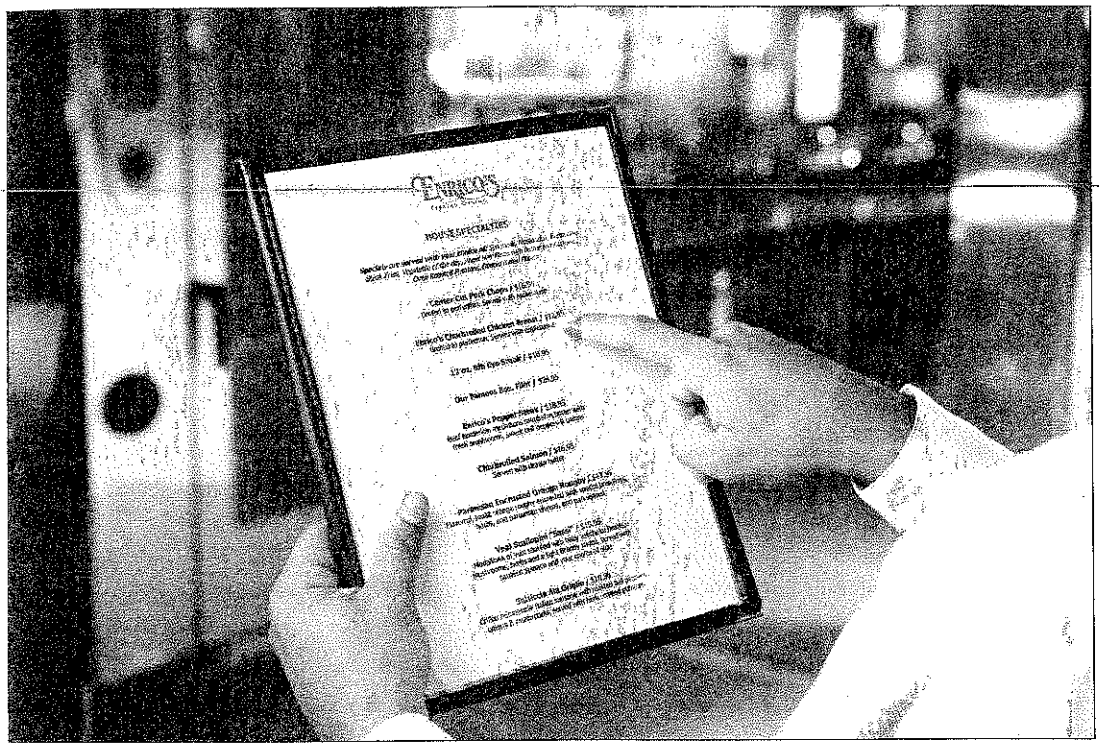


Figure 2.36: Enrico's managers put HACCP principles in action by 1) analyzing their menu; 2) identifying the critical control point for their popular chicken sandwich; and then 3) establishing the critical limit for the CCP.

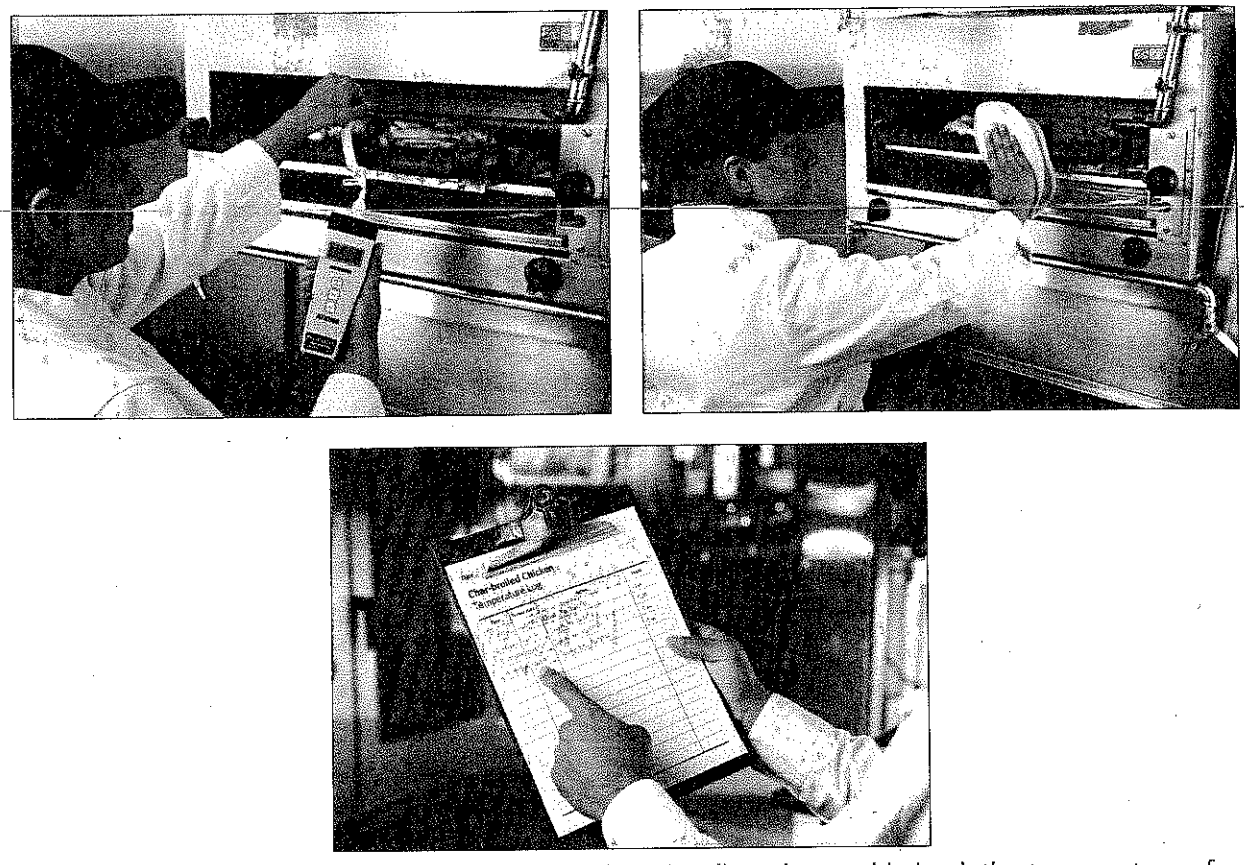


Figure 2.37: Enrico's managers then decided that 4) grill cooks would check the temperature of each chicken after cooking; 5) that the grill cook would continue to cook the chicken if it didn't meet the right temperature; and that 6) managers would check the temperature logs that grill cooks complete to make sure the system was working.

Principle in Action

At Enrico's, each chicken breast is cooked to order. So the team decides to check the critical limit by inserting a clean and sanitized thermocouple probe into the thickest part of each chicken breast.

The grill cook must check the temperature of every chicken breast after cooking. Each chicken breast must reach the minimum internal temperature of 165°F for 15 seconds.

Principle 5: Identify Corrective Actions

What do you do if a critical limit hasn't been met? You must take a **corrective action**, a step to fix the problem. Corrective actions should be determined in advance so everyone knows what to do when critical limits aren't met.

Principle in Action

If the chicken breast hasn't reached its critical limit within the 16-minute cook time, then the grill cook at Enrico's must keep cooking the chicken breast until it has reached it for the required 15 seconds.

This and all other corrective actions are noted in the temperature log.

Principle 6: Verify That the System Works

Determine if the plan is working as intended. Evaluate it on a regular basis. Good record keeping will help you to identify patterns. Use your monitoring charts, records, and hazard analysis to determine if your plan prevents, reduces, or eliminates identified hazards.

Principle in Action

Enrico's management team performs HACCP checks once per shift. They make sure that critical limits have been met and that appropriate corrective actions have been taken when needed.

They also check the temperature logs on a weekly basis to identify patterns. This helps to determine if processes or procedures need to be changed. For example, over several weeks they notice problems toward the end of each week. The chicken breasts often fail to meet the critical limit. Appropriate corrective action is being taken.

Management discovered that Enrico's receives chicken shipments from a different supplier on Thursdays. This supplier provides a 6-ounce chicken breast. Enrico's chicken specifications list a 4-ounce chicken breast. Management works with the supplier to make sure they receive 4-ounce breasts. The receiving procedures are changed to include a weight check.

Principle 7: Establish Procedures for Record Keeping and Documentation

Maintain the HACCP plan and keep all documentation created when developing it. Keep records for the following actions:

- Monitoring activities
- Taking corrective action
- Validating equipment (such as records of inspections or repairs)
- Working with suppliers (such as invoices and purchase specifications)

Principle in Action

Enrico's management team determines that time-temperature logs should be kept for three months. Receiving invoices will be kept for 60 days. The team uses this documentation to support and revise the HACCP plan.

Did You Know...?

The Center for Food Safety and Applied Nutrition (CFSAN) is one of six centers within the Food and Drug Administration (FDA). Its major responsibility is to ensure that food is safe, nutritious and wholesome. The Center regulates approximately $240 billion worth of domestic food and $15 billion worth of imported foods.

Summary

In this section, you learned the following:

- The HACCP principles are as follows:
  - Principle 1: Conduct a hazard analysis
  - Principle 2: Determine critical control points (CCPs)
  - Principle 3: Establish critical limits
  - Principle 4: Establish monitoring procedures
  - Principle 5: Identify corrective action
  - Principle 6: Establish verification procedures
  - Principle 7: Establish procedures for record keeping and documentation
- A HACCP system is important because it focuses on identifying specific points within a food item's flow through the operation that are essential to prevent, eliminate, or reduce hazards to safe levels.

Section 2.4 Review Questions

1. Describe what happens in each of the seven principles of a HACCP system.
2. What is a critical control point (CCP)?
3. What is the purpose of a food safety management system?
4. What is a critical limit?
5. What might Melisa Bouchard do to ensure that all employees understand the importance of a HACCP system?
6. Linda and Chef Jean need to update their HACCP system. They are adding a new menu item, Texas Chili. Identify the hazards for this dish, and then determine the CCP(s), critical limits, and monitoring procedures that the staff should use to keep the chili safe.
7. Suppose you are in a restaurant or foodservice organization with a higher-than-average turnover in the kitchen. How would you ensure adequate monitoring procedures and corrective actions?

Section 2.4 Activities

1. Study Skills/Group Activity: Develop a HACCP Plan

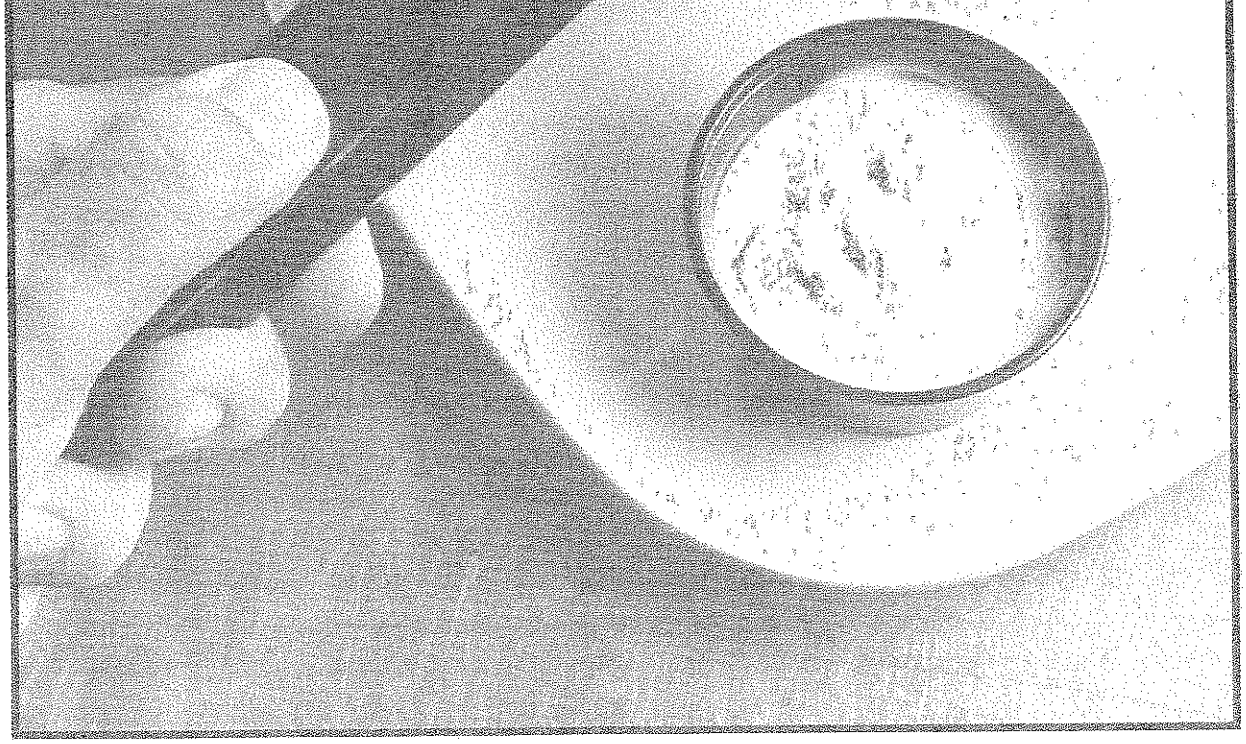
In a group, develop a HACCP system for chicken noodle soup that will be cooked, held, cooled, and reheated.

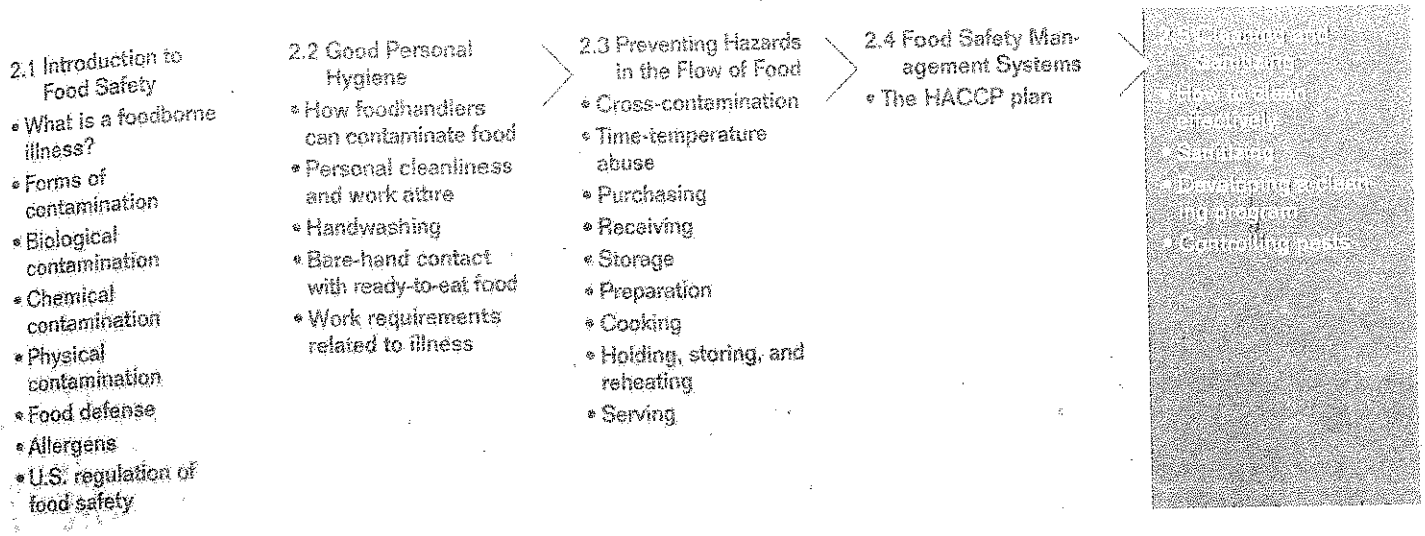
2. Activity: HACCP in Your Community

HACCP systems are often found in chain restaurants and franchises. Call or visit a local chain or franchise restaurant, and ask the manager how HACCP is implemented in the operation. Write a one-page report on the system you learn about, including examples of how HACCP is implemented.

3. Critical Thinking: Making a Food Safety Management System Work

Think about what you have learned so far about preventing foodborne illnesses. What types of policies or procedures do you think should be in place to support a food safety management system?





SECTION 2.5 CLEANING AND SANITIZING

In the previous section, you learned that a good food safety management system depends on food safety programs. A cleaning program is one of the most important of these programs.

Food is less likely to become contaminated in a clean and sanitary kitchen. However, if not done correctly, cleaning and sanitizing can be just as harmful to customers and employees as the illnesses it helps prevent.

Study Questions

After studying Section 2.5, you should be able to answer the following questions:

- What is the difference between cleaning and sanitizing?
- What are the proper procedures for cleaning and sanitizing surfaces?
- What factors affect the effectiveness of sanitizers?
- What are the elements of a master cleaning schedule?
- What organizations certify that equipment meets sanitation standards?
- What is the proper procedure for managing pests?

How to Clean Effectively

Food can be contaminated easily if equipment and kitchen surfaces aren't kept clean and sanitized. **Cleaning** removes food and other dirt from a surface. **Sanitizing** reduces pathogens on a surface to safe levels.

All surfaces must be cleaned and rinsed, including walls, storage shelves, and garbage containers. However, any equipment or surface that touches food, such as knives, stockpots, preparation tables, and cutting boards, must be cleaned and sanitized.

Essential Skills

Cleaning and Sanitizing a Surface

1. Clean the surface. See Figure 2.38a.
2. Rinse the surface.
3. Sanitize the surface. See Figure 2.38b.
4. Let the surface air-dry.

Figure 2.38a: Step 1—Clean the surface.

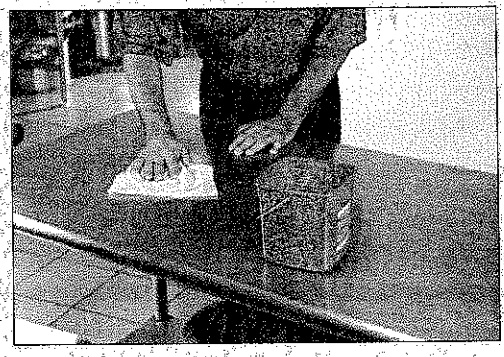


Figure 2.38b: Step 3—Sanitize the surface.

All food-contact surfaces need to be cleaned and sanitized at the following times:

- After they are used
- Before foodhandlers start working with a different type of food
- Any time foodhandlers are interrupted during a task and the items being used may have been contaminated
- After four hours, if items are in constant use

Whatever you are cleaning, never use cloths or towels meant for cleaning food spills. Store cloths or towels for general cleaning in a sanitizer solution between uses. Keep towels that come in contact with raw meat, seafood, or poultry separate from other cleaning towels.

Cleaning Products

Cleaning products are strong chemicals. They must be stored for use in or near the commercial kitchen, but safely away from food. A separate janitor's supply closet or room can serve this purpose. Cleaning products and equipment can be stored there in preassigned and labeled shelves.

Certain cleaners cannot be mixed. A good example is ammonia solution, which should never be mixed with chlorine bleach. This can produce chlorine gas, a toxic fume that can be fatal. Ammonia solutions have harmful fumes of their own and should be kept covered. Only use them in well-ventilated areas.

Chlorine bleach must also be kept covered. Wear protective gloves when pouring or using, because it can burn skin. Store all cleaning supplies in their original containers or in smaller labeled containers. Store Material Safety Data Sheets (MSDS) for every chemical where anyone can find them quickly.

Large foodservice operations can hire a HazMat (hazardous materials) service team to come and help establish a storage system for cleaning products. These service teams can professionally design and set up chemical-storage areas. Operations can also set storage areas up according to a professionally predesigned system. Such plans for systems are available from many chemical-supply companies. They show you how to find and use the chemicals you need while also addressing these issues:

- Keeping volatiles safe
- Protecting from burns
- Controlling for any fume-producers
- Isolating poisonous products

Cleaners

Cleaners are chemicals that remove food, dirt, rust, stains, minerals, and other deposits. They must be stable and safe to use. Always use cleaners as directed. Cleaners can be divided into the following four groups:

- **Detergents** are either general purpose or heavy duty. General-purpose detergents remove fresh dirt and can be used on almost anything. Heavy-duty detergents remove wax, dried-on dirt, and baked-on grease. Dishwasher detergents are an example of a heavy-duty detergent.
- **Degreasers** dissolve grease and work well where grease has burned on, such as on oven doors and range hoods.
- **Delimers** are acid cleaners used on mineral deposits and dirt that other cleaners can't remove. For example, they are designed to clean scaling (mineral deposits such as those left by hard water), rust stains, and tarnish. Delimers must be applied carefully.

- **Abrasive cleaners** have a scouring agent that helps scrub hard-to-remove dirt. Dishwashers often use abrasive cleaners to remove baked-on foods in pots and pans. They must be applied carefully to avoid damaging smooth surfaces.

Sanitizing

Food-contact surfaces must be sanitized after they have been cleaned and rinsed. Sanitizing can be done either by using chemicals or heat. Both methods have specific requirements that must be followed for the sanitizing to be effective.

Heat Sanitizing

One way to sanitize items, such as tableware, utensils, or equipment, is to soak them in hot water. For this method to work, the water must be at least 171°F and items must be soaked for at least 30 seconds. Be sure to check the water with a thermometer.

Chemical Sanitizing

Tableware, utensils, and equipment can be sanitized by soaking them in a sanitizing solution. Employees can also rinse, swab, or spray items with the solution. Different types of sanitizer have different requirements for how long an item must be in contact with the solution. Be sure to read the manufacturer's directions.

Three common types of chemical sanitizers are chlorine, iodine, and quaternary ammonium compounds (or quats). Each type has to be mixed with water to create a sanitizer solution. Make sure to follow the manufacturer's directions when creating the solution. The concentration must be correct, or the sanitizer won't work. To make sure the concentration is right, use a test kit. These are usually available from the sanitizer manufacturer or supplier. Figure 2.39 is an example of a sanitizer test kit.

Factors That Influence the Effectiveness of Sanitizers

Several factors influence the effectiveness of chemical sanitizers:

- **Contact time:** Objects being sanitized must be immersed in the solution for a specific period of time. This is called **contact time.** The contact time depends on the type of sanitizer being used.

- **Temperature:** The water in sanitizing solutions must be the correct temperature.
- **Concentration:** Mixing sanitizer with the proper amount of water is important. The concentration of this mix (the amount of sanitizer to water) is critical. Concentrations that are too high can be unsafe and leave an odor or bad taste on objects. Concentrations that are too low may not be effective in killing pathogens.

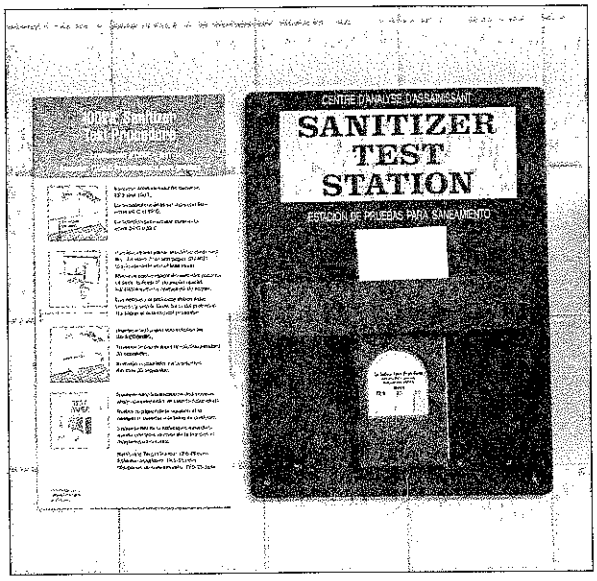


Figure 2.39: Sanitizer test kit.

Cleaning and Sanitizing in a Three-Compartment Sink

Dishwashing staff clean and sanitize tableware and utensils in a dishwashing machine. They often clean larger items, such as pots and pans, by hand in a three-compartment sink. They must be sure to clean and sanitize each sink and drain board before washing any items. Figure 2.40 shows the steps for cleaning and sanitizing items in a three-compartment sink.

Essential Skills

Washing Kitchen Equipment in a Three-Compartment Sink

Start with carefully cleaned and sanitized drain boards and sink compartments. Then fill each compartment with the appropriate liquid—detergent solution, rinse water, and sanitizing solution or hot water.

1. Rinse, scrape, or soak items before washing them.
2. Clean items in the first sink. Wash them in a detergent solution at least 110°F. Use a brush, cloth, or nylon scrub pad to loosen dirt. Change the detergent solution when the suds are gone or the water is dirty.
3. Rinse items in the second sink. Spray them with water or dip them in it. Make sure you remove all traces of food and detergent. If dipping the items, change the rinse water when it becomes dirty or full of suds.

4. Sanitize items in the third sink. Soak them in hot water or a sanitizer solution. If using heat, remember to check the temperature of the water. If using chemicals, remember to use a test kit.
5. Air-dry items. Place items upside down so they will drain.

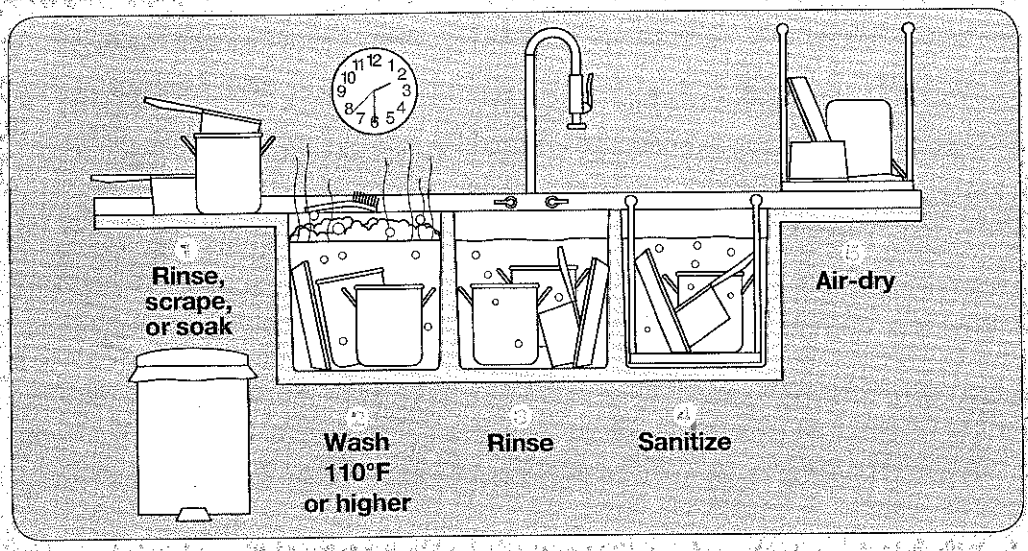


Figure 2.40: Steps 1–5—Washing kitchen equipment in a three-compartment sink.

Cleaning and Maintaining a Dishwasher

It is important to clean and maintain dishwashers frequently throughout the day:

- Clear spray nozzles and food traps of food and other objects.
- Fill tanks with clean water as needed.
- Make sure detergent and sanitizer dispensers are filled.
- Use a delimer to remove mineral deposits when needed.

Always use dishwashers according to the manufacturer's directions. Also, follow these guidelines:

- Scrape, rinse, or soak items before washing.
- Presoak items with dried-on food.
- Never overload the dish racks. See Figure 2.41.
- Use the right rack for the items you are washing.
- Load racks so the water spray will reach all surfaces.
- As each rack comes out of the machine, check for dirty items.
- Rewash dirty items.

Figure 2.41: Overloaded rack (left) and properly loaded rack (right).

- Air-dry all items; never use a towel to dry items.
- Frequently check water temperature and pressure; change the water when necessary.

Equipment

Equipment must meet certain standards, depending on whether the equipment's surfaces come in direct contact with food.

Fortunately, there are organizations to help with the task of choosing equipment. NSF International develops and publishes standards for sanitary equipment design. Underwriters Laboratories (UL) provides listings of equipment that meet NSF and other public health-related standards. Look for the NSF mark or the UL Classified or UL EPH Listed marks on restaurant and foodservice equipment. Only use equipment designed for use in a restaurant or foodservice operation:

- NSF creates standards for restaurant and foodservice equipment. It also certifies equipment. The NSF mark means an item has been evaluated, tested, and certified by NSF as meeting its food-equipment standards.
- UL provides classification listings for equipment that meets ANSI/NSF standards.
- UL also certifies items that meet its own standards for environmental and public health (EPH). Equipment that meets UL EPH standards is also acceptable for restaurant and foodservice use. This equipment has the UL EPH Listed mark.

Learn More

Did You Know...?

Stainless steel sinks are most commonly used in commercial kitchens. Stainless steel offers a good trade-off between cost, usability, durability, and ease of cleaning. They will not be damaged by hot or cold objects and resist damage from impacts. One disadvantage of stainless steel is that, being made of thin metal, it tends to be noisier than most other sink materials. Some of the better sinks include a heavy coating of vibration-damping material to the underside of the sink.

Developing a Cleaning Program

A cleaning program is a system that organizes all of the cleaning and sanitizing tasks in the kitchen. A clean and sanitary operation is critical to a successful food safety management system.

Restaurant and foodservice managers with the most effective cleaning programs focus on three things:

1. Creating a master cleaning schedule
2. Training employees to follow it
3. Monitoring the program to make sure it works

To create a **master cleaning schedule**, you must walk through the facility and look at the way cleaning is done. Then figure out how things need to be cleaned and the ways in which to improve these processes. Next, make a master cleaning schedule. The schedule should have the following information:

- What should be cleaned
- Who should clean it
- When it should be cleaned
- How it should be cleaned

Figure 2.42 is a sample master cleaning schedule.

Once the schedule is created, employees must be trained to follow it. Then managers must make sure the schedule is working by checking that the cleaning is being done. Review and update the schedule as needed, for example, when the menu changes or when new equipment is purchased.

The importance of making sure the schedule is followed cannot be overstated. Effective cleaning helps to keep an operation free of smells, noise, pests, and messiness. It also helps prevent the transfer of pathogens from dirty surfaces to food or to clean surfaces. In addition, it helps customers to feel comfortable and safe in your operation.

Controlling Pests

How do restaurants and foodservice operations prevent pests, such as rodents and insects, from getting in? Good cleaning and sanitizing will help, but probably won't go far enough. So they need an **integrated pest management program (IPM)**. An IPM program is a system that will prevent, control, or eliminate pest infestations in an operation.

Item	What	When	Use	Who
Floors	Wipe up spills	As soon as possible	Cloth, mop and bucket, broom and dustpan	
	Damp mop	Once per shift, between rushes	Mop, bucket	
	Scrub	Daily, closing	Brushes, squeegee, bucket, detergent (brand)	
	Strip, reseal	January, June	See procedure	
Walls and ceilings	Wipe up splashes	As soon as possible	Clean cloth, detergent (brand)	
	Wash walls	February, August		
Work tables	Clean and sanitize tops	Between uses and at end of day	See cleaning procedure for each table	
	Empty, clean, and sanitize drawers, clean frame, shelf	Weekly, Sat. closing	See cleaning procedure for each table	
Hoods and filters	Empty grease traps	When necessary	Container for grease	
	Clean inside and out	Daily, closing	See cleaning procedure	
	Clean filters	Weekly, Wed. closing	Dishwashing machine	
Broiler	Empty drip pan; wipe down	When necessary	Container for grease; clean cloth	
	Clean grid tray, inside, outside, top	After each use	See cleaning procedure for each broiler	

Figure 2.42: A sample master cleaning schedule.

An IPM program has two parts. First, it uses prevention measures to keep pests from entering the operation. Second, it uses control measures to eliminate any pests that do manage to get inside. There are three basic rules for an IPM program:

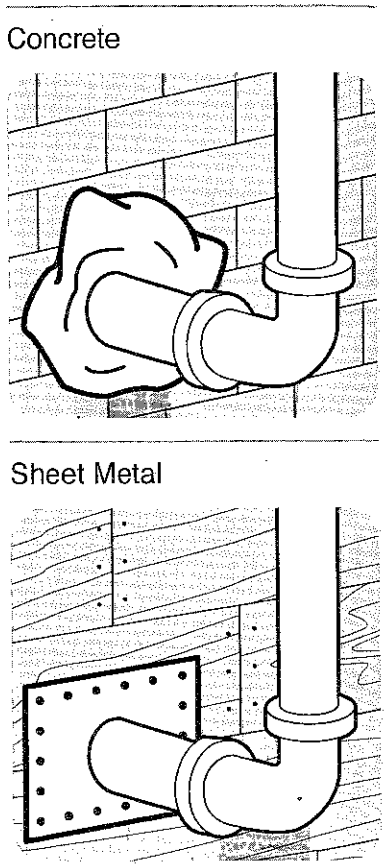
1. Deny pests access to the operation.
2. Deny pests food, water, and a hiding or nesting place.
3. Work with a licensed pest control operator to get rid of pests that do enter the operation.

Pests can enter an operation in one of two ways. Sometimes they are brought inside with deliveries. They can also enter through openings in the building. Prevent pests from entering by paying attention to the following areas:

- Check all deliveries before they enter the operation. Refuse shipments that have pests or signs of pests, such as wings or egg cases.
- Screen all windows and vents, and check the screens regularly for holes and dirt.
- Keep all exterior openings closed tightly. For example, drive-thru windows should be closed when not in use.
- Cover floor drains with hinged grates.
- Seal all cracks in floors and walls with a permanent sealant.
- Use concrete to fill holes or sheet metal to cover openings around pipes, as shown in Figure 2.43.

Pests are usually attracted to damp, dark, and dirty places. A clean operation offers them little access to food and shelter. The stray pest that might get in cannot survive or breed in a clean kitchen. In addition to adhering to the master cleaning schedule, follow these guidelines:

- Throw out garbage quickly and correctly. Don't let it pile up.
- Keep garbage containers clean and in good condition. Keep outdoor containers tightly covered.



Fill openings or holes around pipes with concrete, or cover them with sheet metal.

Figure 2.43: Denying pests entry.

- Clean up spills immediately, including those around garbage containers.
- When possible, use dehumidifiers to keep humidity at 50 percent or lower. Low humidity helps prevent roach eggs from hatching.
- Keep food and supplies away from walls and at least six inches off the floor.
- Store all food and supplies right away.
- Use FIFO for products in storage, so pests don't have time to settle into them and breed.

Even after an operation has made every effort, some pests may still get in. If this happens, work with a **pest control operator**, or **PCO**, to get rid of them. PCOs have access to the most current and safe methods for eliminating pests. They are trained to determine the best methods for eliminating specific pests, are knowledgeable about local regulations, and are experts at applying, storing, and throwing out pesticides.

See Appendix C for additional information on food safety and pest control.

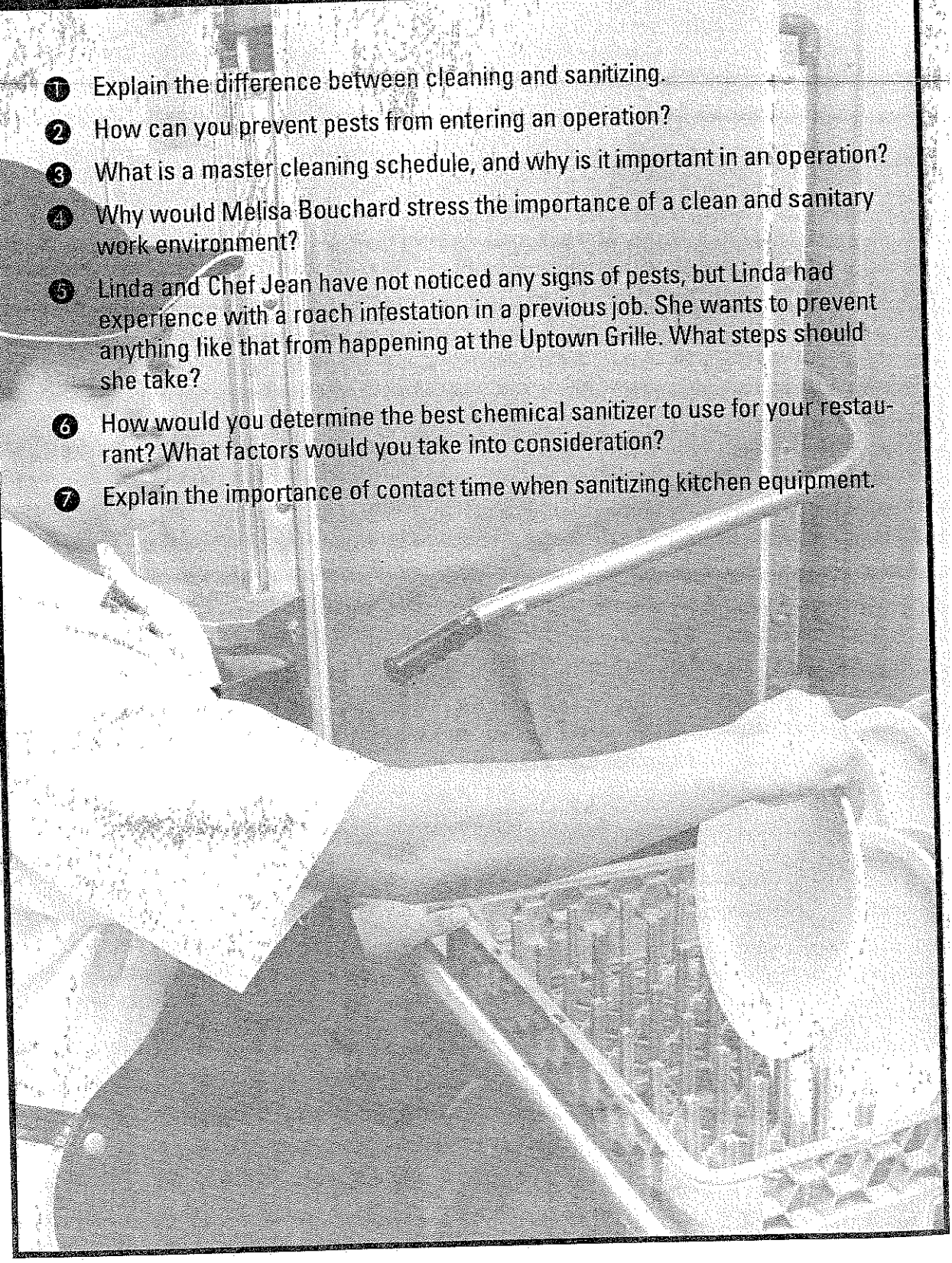
Summary

In this section, you learned the following:

- Cleaning removes food and other dirt from a surface. Sanitizing reduces pathogens on a surface to safe levels.
- All surfaces must be cleaned and rinsed; food-contact surfaces must be cleaned and sanitized. To clean and sanitize a surface, clean, rinse, and sanitize it, and then let the surface air-dry.
- Cleaners can be divided into the following groups: detergents, degreasers, delimers, and abrasive cleaners.
- Contact time, temperature, and concentration affect the effectiveness of sanitizers.
- A master cleaning schedule should identify what should be cleaned, who should clean it, when it should be cleaned, and how it should be cleaned.
- NSF and Underwriters Laboratories (UL) certify that equipment meets sanitation standards.
- To prevent pests from getting into an operation, an operation needs an integrated pest management program (IPM).

Section 2.5 Review Questions

1. Explain the difference between cleaning and sanitizing.
2. How can you prevent pests from entering an operation?
3. What is a master cleaning schedule, and why is it important in an operation?
4. Why would Melisa Bouchard stress the importance of a clean and sanitary work environment?
5. Linda and Chef Jean have not noticed any signs of pests, but Linda had experience with a roach infestation in a previous job. She wants to prevent anything like that from happening at the Uptown Grille. What steps should she take?
6. How would you determine the best chemical sanitizer to use for your restaurant? What factors would you take into consideration?
7. Explain the importance of contact time when sanitizing kitchen equipment.



Section 2.5 Activities

1. Study Skills/Group Activity: Master Cleaning Schedule

Pretend you own a small restaurant. Work in groups of two or three other students to develop a master cleaning schedule for the whole restaurant (kitchen, dining room, and restrooms).

2. Activity: No Pests Allowed!

You manage the foodservice operations for a large nursing home. How do you prevent pests from entering your facility? Develop an action plan.

3. Critical Thinking: How Clean Is It?

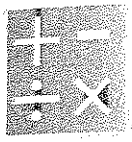
Observe cleaning practices at your school's cafeteria. Do they interfere with the students and faculty who are eating? Do they eliminate hazards?

Case Study Follow-Up *It's All Wrong*

At the beginning of the chapter, Uptown Grille had a very busy day with Linda and Chef Jean being away for most of the day and one of their foodhandlers feeling sick.

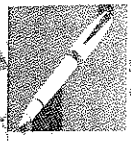
1. What errors did Linda, Chef Jean, Brian, and Michael make today with regard to food safety?
2. How would an outbreak of a foodborne illness affect Uptown Grille? What would be the costs?
3. Based on the events at Uptown Grille today, how can Linda ensure that the restaurant avoids food contamination in the future?
4. How should Chef Jean handle spoilage or contamination of food?

Apply Your Learning



The Danger Zone

In this chapter you have learned about the temperature danger zone for food. You know the boiling temperature at sea level. You know the freezing temperature at sea level. What is the temperature range in which you can safely hold hot foods without boiling them? What is the range for safely holding cold food without freezing?



Public Record

The reports made by public health inspectors are public records in many states. Select a local restaurant and obtain its three most recent inspection reports from your local health department. How has the restaurant improved or declined over time? Give a three-minute oral report on your findings.

The Transformation of Meat

Using a calibrated thermometer, cook three pieces of beef to three different internal temperatures: 145°F, 155°F, and 165°F. Allow the meat to rest for five minutes after removing it from the heat, and then cut each piece open in the center. How does the appearance of the meat change depending on the cooking temperature of each piece? How do the flavor and texture differ from piece to piece? Write two paragraphs summarizing your findings.

Critical Thinking

Beware of Danger

There are living things besides microbes that can harm the food supply. What living things can you think of that could be a problem for a restaurant or foodservice operation? For example, perhaps your establishment is in an old building with a pipe stump from an old system still in an exterior wall. This pipe is open on both ends, from the inside to the outside world. Why could this be a problem? What should be done about it? Select one potential problem and one possible solution, and create a poster about it for the class.

Exam Prep Questions

1. What is the temperature range for the temperature danger zone?
   - **A.** 0°F to 32°F
   - **B.** 41°F to 135°F
   - **C.** 50°F to 140°F
   - **D.** 70°F to 125°F

2. A critical control point (CCP) is a point
   - **A.** in a recipe when ingredients are added.
   - **B.** when chemically contaminated food is identified.
   - **C.** where measures can be applied to prevent hazards.
   - **D.** in the cooking process where food is tasted.

3. The temperature of a roast is checked to see if it has met its critical limit of 145°F for 4 minutes. This is an example of which HACCP principle?
   - **A.** Verification
   - **B.** Monitoring
   - **C.** Record keeping
   - **D.** Hazard analysis

4. First in, first out (FIFO) is a method of
   - **A.** pest control.
   - **B.** stock rotation.
   - **C.** record keeping.
   - **D.** temperature control.

5. How should food be labeled if stored out of its original container?
   - **A.** Contents and date
   - **B.** Foodhandler's name and title
   - **C.** Foodhandler's name and the date
   - **D.** Date and temperature at the time of storage

6. If food-contact surfaces are in constant use, they must be cleaned and sanitized every _____ hours.
   - **A.** 2
   - **B.** 4
   - **C.** 5
   - **D.** 6

7. To prevent food allergens from being transferred to food,
   - **A.** avoid pewter tableware and copper cookware.
   - **B.** store cold food at 41°F or lower.
   - **C.** buy food from an approved, reputable supplier.
   - **D.** clean and sanitize utensils before use.

8. Foodhandlers should keep their fingernails
   - **A.** short and unpolished.
   - **B.** long and unpolished.
   - **C.** long and painted with nail polish.
   - **D.** short and painted with nail polish.

9. To measure the temperature of equipment surfaces, use a(n)

   A. thermistor.

   B. thermocouple.

   C. infrared thermometer.

   D. bimetallic stemmed thermometer.

10. What is the maximum acceptable receiving temperature for fresh beef?

    A. 50°F

    B. 45°F

    C. 41°F

    D. 35°F

11. Where should raw poultry be placed in a cooler that includes raw and ready-to-eat food?

    A. On the top shelf

    B. Next to the produce

    C. On the bottom shelf

    D. Above the ready-to-eat food

12. Thawing food at room temperature could lead to

    A. cross-contamination.

    B. poor personal hygiene.

    C. physical contamination.

    D. time-temperature abuse.

13. The purpose of a food safety management system is to

    A. identify and control possible hazards.

    B. keep all areas of the facility clean and pest free.

    C. identify, document, and use the correct methods for receiving food.

    D. identify, tag, and repair faulty equipment within the operation.