CHAPTER 2

# HACCP Applications

SECTIONS



WRITING ACTIVITY

## Outline

An outline shows the order of topics that will be discussed, how important each of those topics is, and the relationship between the topics. Create an outline for an essay about how to keep a kitchen sanitary.

### Writing Tips

1. Outlines are divided into main points and subpoints.
2. Indent main points and subpoints of the same level equally. Subtopics are indented farther than main topics.
3. Points of equal importance should be at the same level.

EXPLORE THE PHOTO

Check the internal temperature of cooked foods to avoid foodborne illness. ***Why does this help prevent foodborne illness?***

# The Safe Foodhandler

*What can you do to keep food safe?*

## Reading Guide

### Before You Read

**Stay Engaged** One way to stay engaged when reading is to turn each of the headings into a question, and then read the section to find the answers. For example, "Clothes" might be, "What types of clothes are worn in a professional kitchen?"

### Read to Learn

#### Key Concepts

- **Demonstrate** appropriate personal hygiene for the workplace.
- **Illustrate** proper personal health practices to avoid the spread of foodborne illness.

### Main Idea

Foodhandlers must help prevent the spread of foodborne illness. They must practice good personal hygiene, properly wash their hands, wear protective clothing, and report if they are sick.

### Content Vocabulary

- foodhandler
- hygiene
- chef's coat
- protective clothing
- hair restraint
- hand sanitizer

### Academic Vocabulary

- provide
- technique

### Graphic Organizer

As you read, use a chart like this one to illustrate the proper hand-washing procedure. Describe each step.

| Hand-Washing Technique |
|---|
| Step 1: |
| Step 2: |
| Step 3: |
| Step 4: |
| Step 5: |
| Step 6: |

**Graphic Organizer** Go to this book's Online Learning Center at **glencoe.com** for a printable graphic organizer.

### ACADEMIC STANDARDS

**English Language Arts**

**NCTE 12** Use language to accomplish individual purposes.

**Mathematics**

**NCTM Number and Operations** Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

**Social Studies**

**NCSS IV B Individual Development and Identity** Identify, describe, and express appreciation for the influences of various historical and contemporary cultures on an individual's daily life.

**NCTE** National Council of Teachers of English

**NCTM** National Council of Teachers of Mathematics

**NSES** National Science Education Standards

**NCSS** National Council for the Social Studies

# Personal Hygiene

Cross-contamination can cause foodborne illnesses. Foodhandlers usually are the cause of cross-contamination. A **foodhandler** is a worker who is in direct contact with food. You can help prevent foodborne illnesses by practicing good hygiene. **Hygiene** is using good grooming habits to maintain health. You also must know how to properly wash your hands, wear protective clothing, and report illnesses.

Tiny microorganisms can be spread to food by foodhandlers in many ways. Good hygiene is the best defense. Good grooming means that you should arrive at work clean. Bathe daily with soap and water, and wash your hair regularly. Always wear deodorant to work. Your fingernails should be clean, short, and trimmed neatly. It is never appropriate to wear acrylic fingernails or nail polish while working in a commercial kitchen. Acrylic fingernails can fall off into food and become a physical hazard. Nail polish can chip off and fall into food, becoming a chemical hazard.

## Clothes

Hands are not the only way microorganisms can spread. Clothes can also spread bacteria to the food you handle. Dirt can be tracked into the workplace on your shoes and clothes.

Always wear clean clothes to work. Most foodservice establishments will **provide**, or make available, a uniform for you to wear. Uniforms help protect you from spills and cuts, and also make you look more professional on the job. Kitchen foodservice workers often wear a chef's coat. A **chef's coat** is a working coat that traditionally has two rows of buttons down the front, long sleeves, and turned-up cuffs. If you wear your uniform home, wash it before wearing it again.

Your shoes also should be appropriate for the workplace. Make sure they are comfortable. You will be on your feet for many hours at a time. Choose shoes with slip-resistant soles. These will help you avoid accidents. Never wear open-toed shoes at work.

### Small Bites

**Sanitary Jewelry?** The jewelry you wear can carry microorganisms that could make someone sick. Also, your jewelry could fall into the food and create a physical hazard. Both males and females should never wear jewelry while preparing or serving food. All rings, bracelets, necklaces, facial jewelry, earrings, and watches should be removed. Leave jewelry at home to keep it safe.

## Protective Clothing

In addition to the clean clothes or uniform you wear to work, you will wear protective clothing. **Protective clothing** is clothing that is worn to help lower the chances of food contamination. For example, if you work in food preparation or clean-up areas, you will need to wear an apron. Always make sure your apron is clean. Remove it whenever you leave the food preparation area.

Foodhandlers often wear gloves to help prevent cross-contamination. Gloves act as a wall between your hands and the food you handle. This helps prevent cross-contamination. Wash your hands thoroughly before putting on gloves. Never use soiled or torn gloves. You must change gloves after each separate task. Change gloves every four hours if you perform the same task. Always change gloves immediately after handling any raw food.

## Hair

Many microorganisms live in human hair and can be easily transmitted to food. When you brush hair away from your face, microorganisms move to your hands from your hair. When your hands touch food, the microorganisms move to the food. These microorganisms can cause foodborne illness.

Make it a habit to always have clean hair when you arrive at work. Microorganisms can easily grow in dirty, oily hair. Tie back longer hair in a hair restraint. A **hair restraint** is any barrier that holds back head or facial hair to keep it from contaminating food. Some establishments have regulations about

Some establishments have regulations about the type of hair restraints to be used. In general, a good hair restraint, such as a hairnet, will keep your hair away from food. It also will keep you from having to touch your hair while on the job. Some foodhandlers wear a chef's hat. These hats can come in a variety of shapes and sizes, but they all keep hair away from food and off of the face. Foodhandlers with beards should wear beard restraints.

**Reading Check** **Explain** What should you do with your hair when working in a kitchen?

# Personal Health

Foodservice professionals need to be in good physical health when they work with food. Otherwise, harmful bacteria could be spread from the foodhandler to the food that will be served. A foodborne illness outbreak could be the result.

## Proper Hand-Washing

You may think that wearing gloves can replace hand-washing. However, proper hand sanitation is very important in the foodservice industry. This is true even if you wear gloves for most tasks. Hand-washing is the most important thing you can do to prevent the spread of foodborne bacteria.

At first, it may seem silly to think that you need to learn how to wash your hands. However, a proper hand-washing **technique**, or method, can make the difference between a safe workplace and a potentially deadly one. This is because harmful bacteria are so easy to spread by hand.

To clean your hands and arms properly, thoroughly scrub any exposed surfaces with soap and warm water. You should wash your hands every two hours to help prevent cross-contamination. Always remember to wash your hands:

- Before you start work.
- After any work breaks, including those to eat, smoke, drink, or chew gum.
- Before and after you handle raw foods such as meat, fish, and poultry.
- After you touch your hair, face, or body.
- After you sneeze, cough, or use a tissue.
- After you use the restroom.
- After you use any cleaning or sanitizing product.
- After you take out the garbage.
- After you clean dirty dishes and tables.
- After you touch anything that might contaminate food, such as a phone, money, door handles, or dirty tablecloths.

**Hair Restraint** Hairnets help keep hair from falling into your face or onto food. *Why is this important?*

Hand sanitizers can be used after hand-washing. A **hand sanitizer** is a special liquid that kills bacteria on your skin. It is often used without water. While these products can reduce bacteria on your hands, you should never use a hand sanitizer instead of proper hand-washing techniques on the job.

HOW TO

# Wash Your Hands

1. Wet hands and forearms with hot water.

2. Apply enough soap to build up a good lather.

3. Rub hands and arms for at least 15 seconds. Be sure to remove soil from underneath fingernails.

4. Rinse off soap thoroughly under running hot water.

5. Dry hands and arms using a separate paper towel or a warm-air hand dryer.

6. Turn off the water faucet using a paper towel.

## Illness

If you have symptoms of a disease that can be spread to others, such as fever, sneezing, coughing, vomiting, or diarrhea, call your employer immediately. You should not come to work sick. You may spread germs and bacteria to other workers or to customers.

If you feel sick while you are at work, it is your responsibility to tell your supervisor immediately. This is the only way to prevent contamination of the foods and work surfaces you will touch. Your supervisor will most likely send you home to recover. This will not only help prevent the spread of illness, but will help you recover more quickly. You cannot do your best work if you are sick.

## Wounds

If you have a wound that may be infected, or a cut, burn, boil, or other sore, you might not feel sick. However, any bacteria that might be in the wound could easily spread to any of the food that you handle. This could cause a foodborne illness outbreak. Because of this, it is very important that you wash your hands and the wound area thoroughly. Keep cuts completely covered. Make sure the bandage is kept clean and dry. Change the bandage several times throughout the day.

If the wound is on your hand, wear gloves whenever possible as you perform your duties. Make sure your gloves do not become ripped or torn.

If you have a wound on your hand, even if it is covered by a bandage, you may be reassigned to a work area where you will not come into direct contact with food. This might include washing dishes, running the cash register, or cleaning kitchen or dining room areas.

**Reading Check** **Summarize** What is the most important thing you can do to prevent the spread of bacteria?

# SECTION 2.1 After You Read

## Review Key Concepts

1. **Explain** the proper use of gloves.
2. **Describe** what to do if you have a wound.

## Practice Culinary Academics

### Social Studies

3. In addition to hair restraints, chefs also wear a hat. One type of chef's hat is called a toque-blanche, and it has a very distinctive shape. Research the history of the toque-blanche and write a paragraph explaining its history.

**NCSS IV B Individual Development and Identity** Identify, describe, and express appreciation for the influences of various historical and contemporary cultures on an individual's daily life.

### English Language Arts

4. Choose a partner and take turns demonstrating proper hand-washing techniques to each other. Have your partner evaluate your hand-washing technique. Then, evaluate your partner's hand-washing technique.

**NCTE 12** Use language to accomplish individual purposes.

### Mathematics

5. Recent research suggests that foodservice workers should trim their fingernails to 1/16 inches or shorter. Imagine you work at a restaurant, and you want to comply with this standard. If one of your fingernails is currently 0.11 inches long, how much, if any, must be trimmed?

**Math Concept** **Working with Fractions and Decimals** To perform a calculation involving both a fraction and a decimal, first convert all numbers to decimals. To convert a fraction to a decimal, divide the numerator by the denominator.

**Starting Hint** To convert 1/16 into a decimal, divide 1 by 16. Subtract this number from 0.11 to determine how much of your fingernail, if any, will need to be trimmed.

**NCTM Number and Operations** Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

Check your answers at this book's Online Learning Center at **glencoe.com**.

# The HACCP System

*Recognize important safety procedures in a professional kitchen.*

## Reading Guide

### Before You Read

**Get a Notepad** It is normal to have questions when you read. Write down questions while reading. Many of them will be answered if you continue. If they are not, you will have a list ready for your teacher when you finish.

### Read to Learn

#### Key Concepts

- **Explain** the purpose of the HACCP system.
- **Outline** the processes of monitoring, corrective action, record keeping, and verification.

### Main Idea

HACCP is a system developed to monitor the flow of food. The system helps foodservice workers control hazards and lower risks.

### Content Vocabulary

- flow of food
- HACCP
- critical control point
- minimum internal temperature
- food thermometer
- calibrate
- record-keeping system
- log

### Academic Vocabulary

- improved
- verify

### Graphic Organizer

As you read, use a sequence chart like the one below to display the steps in the HACCP system. Write out each step in the rows below in the order in which you would perform them.

| HACCP System |
|---|
| First Step: |
| Next Step: |
| Next Step: |
| Next Step: |
| Next Step: |
| Next Step: |
| Last Step: |

**Graphic Organizer** Go to this book's Online Learning Center at **glencoe.com** for a printable graphic organizer.

### ACADEMIC STANDARDS

**English Language Arts**
**NCTE 8** Use information resources to gather information and create and communicate knowledge.

**Mathematics**
**NCTM Measurement** Understand measurable attributes of objects and the units, systems, and processes of measurement.

**Science**
**NSES 1** Develop an understanding of systems, order, and organization.

**Social Studies**
**NCSS VIII B Science, Technology, and Society** Make judgments about how science and technology have transformed our understanding of human-environment interactions.

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# HACCP Basics

As food moves through a foodservice operation, it is important to be able to spot potential hazards. By using a time-tested system called HACCP, the flow of food can be monitored. The **flow of food** is the path food takes from when it is received by an establishment to when it is disposed of as waste. Along this path, any hazards can be controlled and risks lowered.

Local health departments regularly inspect foodservice establishments. Your workplace should also inspect the kitchen to keep conditions sanitary. **HACCP**, or Hazard Analysis Critical Control Point, is the system used to keep food safe on its journey from the kitchen to the table. HACCP shows workers how to properly handle food, how to monitor food safety, and how to keep accurate records.

The HACCP system was developed by the Pillsbury Company for the National Aeronautics and Space Administration (NASA) in the early 1960s. The system was originally created to keep food safe in outer space. The HACCP system worked so well that it was used by many parts of the food industry. Over the years, HACCP has been **improved**, or made better. HACCP is now a standard food safety system used worldwide. The HACCP system looks at the flow of food through the foodservice establishment at several critical points. It helps foodservice employees:

- Identify foods and procedures that are likely to cause foodborne illness.
- Develop cleaning and sanitation procedures that will reduce the risk of foodborne illness.
- Monitor procedures to keep food safe.
- Keep records of how well the system works. (See **Figure 2.1**.)

**FIGURE 2.1 The HACCP System**

**Safety System** The Hazard Analysis Critical Control Point system creates a structure to help ensure food safety. *Why do you think having a structure is important?*

**Determine where food safety hazards might happen.** For example, you might start by listing the areas and equipment that food comes in contact with while it is in the kitchen.

↓

**Find the critical control points where contamination could happen.**

↓

**Set standards that are necessary for food to be considered safe.** For example, set temperature limits for foods to be safe in storage areas.

↓

**Create a procedure to monitor the standards.** For example, you might use a thermometer to check the temperatures of all foods and keep a record of these temperatures.

↓

**Take corrective action.** For example, if a food does not meet an internal temperature standard, you may decide to change the cooking time.

↓

**Evaluate your procedures regularly.** You may need to modify your procedures to keep food safe.

↓

**Develop a record-keeping system that identifies:**

- Who documents the procedures.
- How documentation should be performed.
- When documentation should be performed.

**FIGURE 2.2 HACCP Analysis—The Flow of Food**

**Handling Hazards** These critical control points show the steps in the flow of food where contamination can happen. *Whose responsibility is it to make sure that these control points are monitored?*

| Potential Hazard | Control Point | Corrective Action |
|---|---|---|
| Identifying hazardous items; improper food preparation | Menu items and recipes | Proper training |
| Receipt and acceptance of contaminated food products | Receiving | Inspect each delivery; reject contaminated goods |
| Cross-contamination; improper storage resulting in spoilage; bacteria | Storing | Follow storing procedures; maintain proper storage temperatures; discard old items |
| Cross-contamination; bacteria | Food preparation | Good personal hygiene; gloves; hand-washing; clean and sanitize utensils and work surfaces |
| Bacteria not killed; physical and chemical contaminants | Cooking | Achieve the minimum internal temperature; be aware of potentially hazardous foods, such as raw meats and eggs |
| Bacteria; physical contaminants | Food holding and serving | Maintain proper temperatures; use clean serving equipment |
| Bacteria | Cooling | Apply rapid cooling methods; store food properly |
| Bacteria | Reheating | Heat food rapidly; do not mix old food with new food |

## Food-Handling Hazards

The first step of the HACCP system is to identify and evaluate hazards. These hazards could cause illness or injury if they are not controlled. The most frequently found hazards include:

- Poor personal hygiene
- Contaminated raw foods
- Cross-contamination
- Improper cooking
- Improper holding
- Improper cooling
- Improper reheating
- Improper cleaning and sanitizing of equipment

Any of these hazards can lead to an outbreak of foodborne illness at a foodservice establishment. Because of this, it is critical that all foodservice workers follow the established HACCP system.

## Critical Control Points

The next step in the HACCP system is to carefully look at each critical control point. (**Figure 2.2** and **Figure 2.3** show the critical control points, and how a HACCP kitchen is set up.) A **critical control point** is a step in the flow of food where contamination can be prevented, reduced, or eliminated. For example, harmful bacteria and other microorganisms can grow in improperly cooked food. Microorganisms may survive cooking and contaminate the food. This could make diners very sick.

**Cool Food Safely** Cooling food must be done safely. If food is cooled improperly, harmful bacteria can grow. Cooling food quickly prevents bacterial growth. According to the U.S. Centers for Disease Control and Prevention, food that was not cooled properly is the most common cause of all reported foodborne illnesses.

This is one technique you can use to cool food safely:

1. Place food in a shallow pan.
2. Place the pan of food into a large pan filled with ice. Do not stack more than one pan of food on top of the large pan of ice.
3. Use a thermometer to check the internal temperature of the food often. Foods that have an internal temperature of 135°F (57°C) should drop to 70°F (21°C) within two hours and to 41°F (5°C) or below within four hours. Add ice as needed.
4. When the chilled temperature has been reached, remove the pan of food from the pan of ice. Dry the bottom of the pan of food and place a lid on it.
5. Label the pan of food with the date the food was prepared and its temperature at the time of storage.
6. Place the pan on the top shelf of the refrigerator.

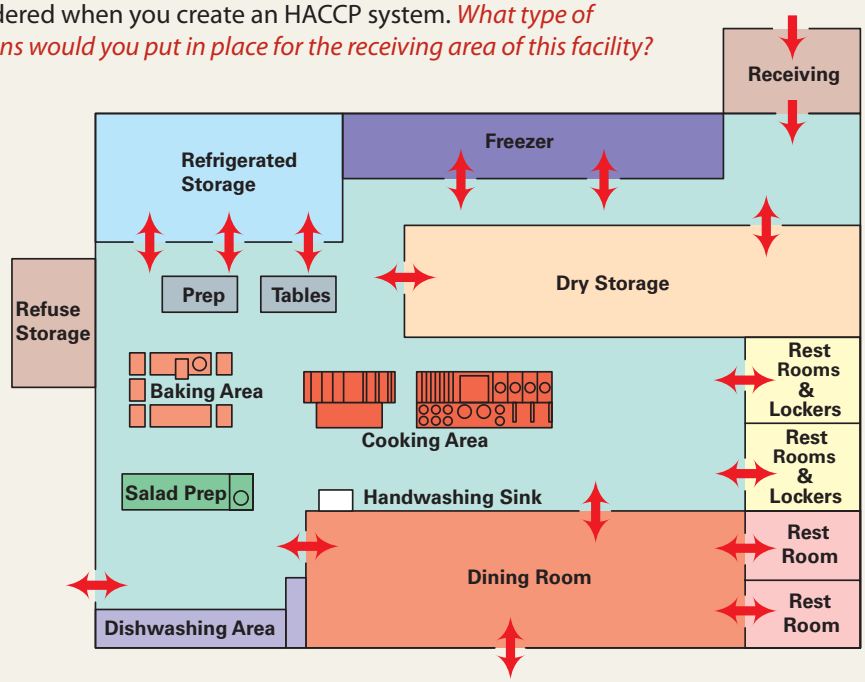
**Hazard Control** After you have identified the critical control points, it is important to take steps to lower risks. For example, temperature and time are two important measurements that impact food safety. The HACCP system has standards for the temperatures of cooked foods.

The high temperatures you use when you cook food kill most of the food's harmful bacteria. The **minimum internal temperature** is the lowest temperature at which foods can be safely cooked. Microorganisms cannot be destroyed below this temperature. The minimum internal temperature is different from food to food. It is important to learn the correct temperature for each food you prepare. (See **Figure 2.4** on page 34.)

**Temperature Danger Zone** The temperature danger zone for holding foods is 41°F to 135°F (5°C to 57°C). (See **Figure 2.5** on page 34.) Hot foods must be thrown away after four hours if they are not held at 135°F (57°C) or above. If the temperature of food being held at 135°F (57°C) or above falls below 135°F (57°C), it should be reheated to at least 165°F (74°C). If the temperature drops below 135°F (57°C) again, the food should be discarded.

**FIGURE 2.3 HACCP Kitchen Design**

**Control Points** Each part of a foodservice establishment should be considered when you create an HACCP system. *What type of precautions would you put in place for the receiving area of this facility?*



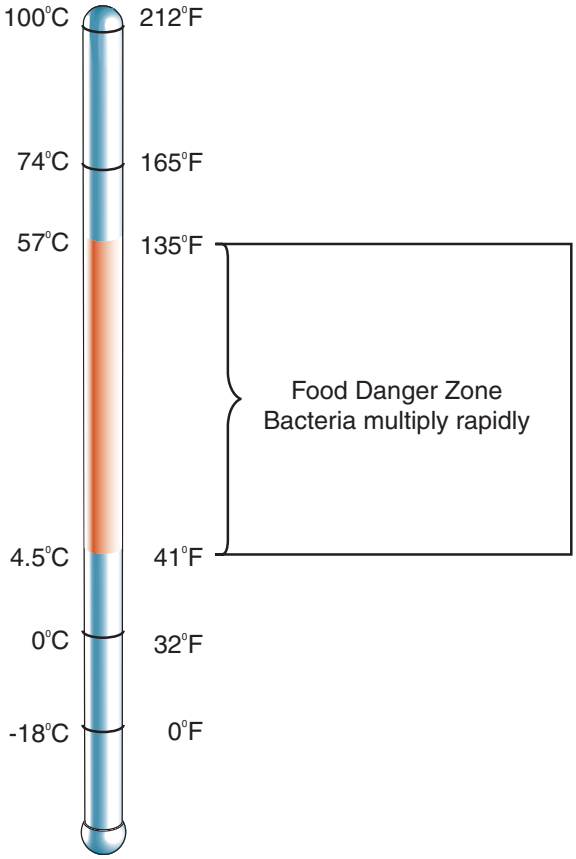



**FIGURE 2.5 Food Danger Zone**
**Safe Food Temperatures** The temperature danger zone for food is 41°F to 135°F (5°C to 57°C). *What should you do with food that has been in the danger zone for more than four hours?*

**Food Thermometers** There are many different types of food thermometers available. A **food thermometer** is a device used to check the temperatures of foods. The U.S. Food and Drug Administration (FDA) suggests these types for cooking:

- **Liquid-filled thermometers** are best used for casseroles and soups. They can break. They cannot measure thin foods.
- **Bimetal thermometers** are best used for roasts, casseroles, and soups. Some are safe to use in the oven, and some are not. They do not measure thin foods well.
- **Thermistor thermometers** are best used for foods such as hamburger patties and pork chops. They can measure the temperature of thin foods.
- **Thermocouple thermometers** are best used for foods hamburger patties and pork chops. They take readings very quickly, and can easily measure thin foods.
- **Infrared thermometers** can measure temperature quickly and accurately.

To measure the internal temperature of cooked food, place the thermometer in the thickest part of the food. Take at least two readings in different places. Do not place

**FIGURE 2.4 Safe Internal Cooking Temperatures**
**Internal Temperatures** Foods must be kept at specific internal temperatures to be considered fully cooked and safe to eat. *Why is it important for foods to be kept at a minimum internal temperature for a specific amount of time?*

| Food Item | Temperature | Time |
|---|---|---|
| **Pork, ham, bacon** | 145°F (63°C) | 15 seconds |
| **Poultry, stuffed meats and pasta, casseroles, stuffings** | 165°F (74°C) | 15 seconds |
| **Roasts (beef and pork)** | 145°F (63°C) | 4 minutes |
| **Hamburger, ground pork, sausages, flaked fish** | 155°F (68°C) | 15 seconds |
| **Steaks, veal, lamb** | 145°F (63°C) | 15 seconds |
| **Fish** | 145°F (63°C) | 15 seconds |
| **Eggs** | 145°F (63°C) | 15 seconds |

the thermometer too close to bone. Bone conducts heat quickly. This may give you a false temperature reading. Use thermometers to check the temperature of delivered foods, too. Fresh foods should be received at a temperature of 41°F (5°C) or below. Thermometers should be accurate to within 2 degrees.

Thoroughly clean, sanitize, and air dry the thermometer after each use. This will help you avoid cross-contamination. Thermometers should be calibrated (ˈka-lə-brāt-əd) before each work shift or each food delivery. To **calibrate** a thermometer, you adjust it for accuracy. A thermometer should be recalibrated every day, and again if it is dropped.

**Reading Check** **Identify** What are the temperatures in the temperature danger zone, and the time limit for food?

# System Monitoring

Foodservice workers are responsible for monitoring the food safety systems that are in place. This helps workers ensure that proper procedures are followed in the flow of food. They can also help spot potential problems.

For example, monitoring might include taking the temperature of turkey breast when it is received. You would make sure it is stored at 41°F (5°C) or below. You would also think about contamination that could happen when the turkey breast is stored. Raw turkey breast should be stored on the bottom shelf, below cooked foods in the refrigerator and any foods that are ready to eat. This will prevent raw turkey juices from contaminating any foods stored beneath the turkey breast.

## Corrective Action

When you find a potential problem at a critical control point, you should take corrective action immediately. It is the responsibility of each foodservice worker to make sure that the kitchen and dining environments are safe places for customers to prepare food and eat.

For example, you see a foodhandler taking out the garbage, and then returning to the kitchen. You notice that the foodhandler has not washed his or her hands before entering the kitchen. What would you do? You should take immediate corrective action. Remind the foodhandler that garbage can be a breeding ground for harmful bacteria and other microorganisms. The foodhandler must wash his or her hands to avoid cross-contamination. Handling food with dirty hands could result in a foodborne illness.

## Record Keeping

Record keeping is an important part of any safety and sanitation system. Most record-keeping systems are simple to use. A **record-keeping system** includes flow charts, policy and procedure manuals, written descriptions, and food temperature readings taken at different times.


**Taking Temperatures** Foodservice operations use a variety of food thermometers. *What types of thermometers work best with thin liquids?*

Logs are usually completed at the end of each work shift or meal period throughout the day. A **log** is a written record of day-to-day actions and procedures. Find out what record-keeping system is used at your food-service establishment, and what records your supervisor wishes to keep. Complete logs carefully.

## Verification

A very important step in the HACCP system is to **verify**, or prove, that your system works correctly. You should be able to show standard operating procedures for a HACCP system. The flow of food should be traced at the end of each work shift by the chef or manager. He or she should read logs of temperature and time, spot any errors, and take corrective action if necessary.

**Reading Check** **Explain** What should you do if you find a potential problem at a critical control point?

## A Taste of History

**2004** The Spirit rover leaves Cape Canaveral, Florida, for the planet Mars

**2007** Mandatory pasteurization of all California almonds begins

### Battle Against Bacteria

French scientist Louis Pasteur was a pioneer in the study of microbiology. He was the first person to understand that bacteria can cause disease, and his experiments led to a process known as pasteurization. During pasteurization, controlled heat is applied to food to kill microorganisms that could cause disease or spoilage. Pasteurization had a major impact on the food industry. Today, pasteurization is commonly used for milk and other dairy products.

### History Application

Research Pasteur's discovery of how bacteria and disease are linked and how pasteurization works. Write a paragraph discussing how you believe milk and milk products have been improved because of its use.

**NCSS VIII B Science, Technology, and Society** Make judgments about how science and technology have transformed our understanding of human-environment interactions.

## SECTION 2.2 After You Read

### Review Key Concepts

1. **List** what HACCP shows foodservice employees.
2. **Explain** how to verify an HACCP system.

### Practice Culinary Academics

#### Science

3. **Procedure** Choose a recipe. Identify the potential hazards you might find while creating it, and how they could be avoided.

   **Analysis** Choose one hazard you have identified, and create a step-by-step procedure to avoid it.

**NSES 1** Develop an understanding of systems, order, and organization.

#### English Language Arts

4. Research the different types of food thermometers available and create a visual presentation with the three best options.

**NCTE 8** Use information resources to gather information and create and communicate knowledge.

#### Mathematics

5. You are preparing a chicken dish. On the counter is poultry that has been left at a temperature of 17.5°C for 15 minutes. How many minutes remain in the poultry's temperature danger zone?

**Math Concept** **Converting Temperature** Celsius temperatures (C) can be converted to Fahrenheit (F) using the following formula: $F = (\frac{9}{5} \times C) + 32$.

**Starting Hint** Convert 17.5°C into °F by multiplying 17.5 by $\frac{9}{5}$ and adding 32 to the result. Check your answer against the danger zone temperatures.

**NCTM Measurement** Understand measurable attributes of objects and the units, systems, and processes of measurement.

Check your answers at this book's Online Learning Center at **glencoe.com**.

# The Flow of Food

*Follow food as it moves through a foodservice establishment.*

## Reading Guide

**Before You Read**

**What You Want to Know** Write a list of what you want to know about the flow of food. As you read, write down the heads in this section that provide the information.

### Read to Learn

#### Key Concepts

- **Summarize** the steps in safely receiving and storing food.
- **Identify** safe holding, serving, cooling, and reheating guidelines.
- **Explain** how to properly clean, sanitize, and store dishes and glassware.

### Main Idea

Foodservice workers need to be conscious of food safety and sanitation at each point in the flow of food, from receiving deliveries through serving.

### Content Vocabulary

- receiving
- storage
- shelf life
- first in, first out
- shucked
- processing
- pasteurize
- produce
- perishable
- food preparation
- holding
- disposal point
- recycle
- manual dishwashing

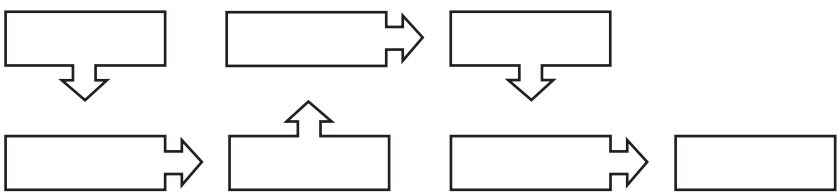
### Academic Vocabulary

- ideal
- affect

### Graphic Organizer

As you read, use a flow chart like the one below to show the all of the points in the flow of food. Fill in each box with a point in the flow of food, starting with the first and ending with the last.

**Flow of Food**



**Graphic Organizer** Go to this book's Online Learning Center at **glencoe.com** for a printable graphic organizer.

### ACADEMIC STANDARDS

**Mathematics**

**NCTM Problem Solving** Apply and adapt a variety of appropriate strategies to solve problems.

**NCTM Data Analysis and Probability** Select and use appropriate statistical methods to analyze data.

**Science**

**NSES F** Develop an understanding of personal and community health.

**NCTE** National Council of Teachers of English

**NCTM** National Council of Teachers of Mathematics

**NSES** National Science Education Standards

**NCSS** National Council for the Social Studies

# Receive and Store Food

Critical control points are important in the flow of food. It is here that special attention is given to food products to prevent contamination. At each point in the flow of food, from receiving through serving, you need to be concerned with food safety and with sanitation.

Safety and sanitation procedures begin with receiving. **Receiving** is accepting deliveries of food and supplies. All food products must be carefully inspected for damage. You also should check that the food has been kept at the proper temperatures during delivery. As a foodservice professional, you need to look for these potential receiving problems:

- Foods that have been thawed and refrozen
- Foods that have an insect infestation
- Damaged foods or containers
- Items that have been repacked or mishandled
- Foods handled at incorrect temperatures

## Storage Tips

Storage is another control point where improper handling can cause contamination. **Storage** means placing food in a location for later use. Always keep storage areas clean and dry. Make sure the temperature in storage areas is carefully monitored. Never store food in an unsanitary place, such as near sewage or in a bathroom.

There are three types of storage: dry, refrigerated, and frozen. The type of storage used depends on the type of food product being stored, and its shelf life. A product's **shelf life** is the period of time it can be stored and still be good to use.

### Dry Storage

Foods that have a long shelf life are placed in dry storage. Flour, salt, dried beans, and canned foods are examples of items that should be kept in dry storage. The **ideal**, or perfect, temperature in a dry storage area is 50°F to 70°F (10°C to 21°C). All food products in dry storage should be kept at least 6 inches off the floor and at least 6 inches away from the wall. Clean and sanitize dry storage shelves and areas regularly.

### Refrigerated Storage

Food products that need to be kept refrigerated should be stored at or below 41°F (5°C). Clearly label and date all containers when they are first stored. To prolong the shelf life of a refrigerated product, use the first in, first out (FIFO) inventory program. In the **first in, first out** program, food products that are oldest are used first, before newer products. This way, all products are fresh when they are used.

Store cooked foods and raw ingredients separately to prevent cross-contamination. If prepared or cooked and raw foods must be stored on the same side or shelving unit, always store cooked foods above raw foods. Frozen foods that are being thawed in the refrigerator should always be stored below prepared foods. Be sure to leave room around foods for air to circulate. Do not place hot foods in the refrigerator to cool.

### Frozen Storage

Store frozen foods at 0°F (18°C) or below. Clearly label and date all containers when they are first stored. Never put a hot food product into a freezer, because this will **affect**, or act upon, the temperature of the storage area. It could cause foods in the freezer to thaw and remain in the temperature danger zone for too long.

### Small Bites

**Bacteria and pH** The pH scale measures the acidity of a substance. The pH scale runs from 0 to 14. From 0 to 7 is acidic, from 7 to 14 is alkaline, and 7 is neutral. Neutral environments are the best for growing bacteria. The more acidic a food is, the less likely it is that bacteria will grow.

## Storage by Food Type

Different foods are stored in different places. All foods should be stored properly. This will prevent contamination, spoilage, and the growth of harmful bacteria.

### Seafood

Fish and shellfish are very sensitive to temperature changes. If the proper temperature for seafood is not maintained, microorganisms will grow rapidly.

Fresh, whole fish should be packed in ice at a temperature of 41°F (5°C) or lower. The fish should have bright, shiny skin. The texture should be firm and the flesh should spring back when touched.

The FDA closely oversees the shipping of shellfish. Shellfish must be purchased from an FDA-approved supplier. Shucked shellfish in packages of less than one-half gallon will have a sell-by date clearly shown on the label. **Shucked** shellfish have been removed from the shell. Packages with more than one-half gallon of shellfish will show the date the shellfish were shucked.

If you receive a container of live clams, oysters, or mussels, you must write the date they were delivered on the tag that is fastened to the container. These identification tags must remain attached until the last one is used, then kept for 90 days after the harvest date. This information is used to determine the source of possible contamination if a foodborne illness breaks out.

## Gourmet Math

### Cool Foods Safely

You would like to use a two-stage cooling process to bring a pot of minestrone soup from 170°F down to a safe temperature for storage (41°F). The soup sits at room temperature for 15 minutes while you divide it into smaller containers. Next, you leave the containers in an ice bath for 1 hour and 45 minutes. Finally, you move the soup containers into the refrigerator for 2 hours. If hot soup cools at 16°F per hour at room temperature, at 56°F per hour in an ice bath, and at 15°F per hour in the refrigerator, will your soup cool safely?

**Math Concept** **Applying Rates** If you know the rate at which a value changes per hour, multiply that rate by the amount of time (in hours) to find the total change during that time period.

**Starting Hint** Convert each time period into hours (since the cooling rates are also given in hours). There are 60 minutes in an hour, so the 15 minutes at room temperature converts to $\frac{15}{60}$ = 0.25 hours. Multiply 0.25 hours by the cooling rate of 16°F per hour to find the total decrease during that period. Repeat this process for the ice bath and the refrigerator.

**NCTM Problem Solving** **Apply and adapt a variety of appropriate strategies to solve problems.**

## Fresh Meat and Poultry

Government agencies inspect fresh meat and poultry to make sure it is free from disease. Meat and poultry also must be purchased

## Sanitation Check

### The Kitchen Glow Test

Although work surfaces, equipment, walls, and floors may look clean, they may still be contaminated on a microscopic level. One way to uncover the presence of bacteria is through adenosine triphosphate bioluminescence (ə-ˈde-nə-ˌsēn (ˌ)trī-ˈfäs-ˌfāt ˌbī-ō-ˌlü-məˈne-sən(t)s), or the glow test. Adenosine triphosphate, or ATP, is an energy molecule found in all living cells. Bacteria contains ATP molecules.

To test for the presence of ATP, an enzyme called luciferase (lü-ˈsi-fə-ˌrās) is placed on the area to be tested. Luciferase is the enzyme found in the tails of fireflies. If luciferase comes into contact with ATP, it glows with light, called bioluminescence. A machine called a luminometer tests the amount of light. The stronger the light, the more contaminated the area.

**CRITICAL THINKING** *How can the glow test help you make the kitchen safer?*

from processing plants approved by the United States Department of Agriculture (USDA). Products that have been inspected have a seal of approval. (See **Figure 2.6**.) The USDA has strict quality standards and regulations that must be followed to earn these stamps.

However, microorganisms can still grow on foods even during processing. **Processing** means that food has been cleaned and prepared so that it can be cooked and eaten. These microorganisms can grow rapidly and contaminate the food. Look for these signs to make sure your meat and poultry are fresh:

**Temperature** The product should be delivered at 41°F (5°C) or below.

**Color** Beef and lamb should be red; pork should be light pink. Poultry should not have a purple or green color. It should not have dark wing tips.

**Odor** Meat and poultry should not have an offensive or sour odor.

**Texture** Meat should not feel slimy. Poultry should not be sticky under the wings or around joints.

**Packaging** Check for broken cartons, soiled wrappers, and leaks.

**FIGURE 2.6 Inspected Meat and Poultry**
**Seal of Approval** Foods that have been inspected by the USDA have a seal of approval. *What types of foods must be inspected by the USDA?*


## Safety Check

### Egg Safety

Take the following extra precautions when you prepare eggs:

- Always store eggs and foods that contain eggs separately from raw foods. Also, store eggs away from foods that may have an undesirable odor. Eggs absorb odors easily.
- Always wash your hands before and after working with eggs and foods that contain eggs.
- Wash, rinse, and sanitize utensils, equipment, and work surfaces after you prepare eggs or products that contain eggs.
- Make sure cooked eggs do not sit out for more than a very short period of time.

**CRITICAL THINKING** *Why do foodservice professionals need to be extra cautious when they work with eggs?*

## Eggs

Like meat and poultry, eggs must be purchased from USDA-approved processing plants. Make sure the eggs you receive and store have the USDA inspection stamp. This stamp shows that the eggs have been purchased from a government-approved supplier.

When the eggs arrive at a foodservice establishment, they must be checked. Eggs should be received by the establishment within a few days of the packing date at the processing plant. Eggs should be delivered clean, dry, and uncracked. Store eggs immediately in a properly refrigerated storage area.

## Dairy Products

Foodservice establishments should purchase and serve pasteurized dairy products. To **pasteurize** is to heat a product at high enough temperatures to kill harmful bacteria. Unpasteurized products can contain harmful microorganisms that can cause foodborne illness. Milk and milk products labeled Grade A are best used for cooking. Dairy products, such as cheese, sour cream, yogurt, and butter, should be received at 41°F (5°C) or below.

## Refrigerated and Frozen Foods

Many foodservice establishments use some foods that have already been prepared before they are received. Refrigerated processed foods should be delivered at 41°F (5°C) or below. Always closely inspect packages to check for damage.

All frozen foods should be completely frozen when they arrive at your facility. Check for signs that the food product has thawed and then been refrozen. The food may look discolored or dry, or ice crystals may be present. Another sign of thawing is liquid at the bottom of a product's container.

## Dry and Canned Goods

Dry and canned goods have a longer shelf life than fresh meat, poultry, eggs, or fresh fruits and vegetables. But that does not mean you should not be concerned about food safety. Follow these guidelines to store dried foods:

- Inspect packages for damage.
- Keep dried foods in tightly sealed containers.
- Keep containers in a dry place.
- Watch for signs of insects and rodents.
- Check regularly for signs of spoilage.

You must also pay close attention to commercial canned goods. Signs of potential contamination include bulges, leaks, dents, and rust. (See **Figure 2.7**.)

## Fresh Produce

The right temperature for receiving and storing fresh produce depends on the product. **Produce** is fresh fruits and vegetables. Remember, however, fresh fruits and vegetables are perishable. **Perishable** ('per-i-shə-bəl) products are products that can spoil quickly, especially if they are not stored properly.

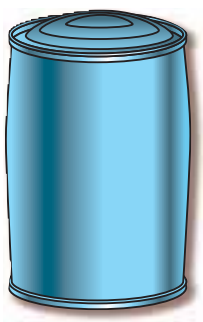
Follow these general guidelines to receive and store fresh produce:

- Do not wash produce before storing. Wash produce just prior to preparing it. Extra water can cause mold and bacteria to grow.
- Handle produce with care. Most fruits and vegetables bruise easily.
- Check produce for insects and insect eggs.
- Check produce for spoilage, such as mold, bruising, or wilting.

**Reading Check** **Summarize** What are the three types of food storage, and how are they used?

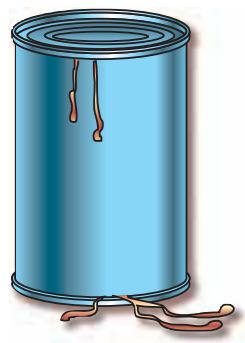
**FIGURE 2.7 Unsafe Canned Goods**

**Cans to Avoid** Cans with signs of bulging, dents, rust, or leaks should be immediately thrown away. *What advantage do commercially canned goods have over fresh foods?*



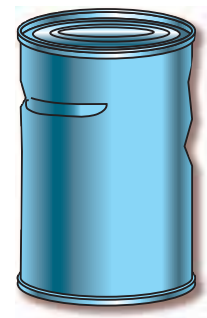
**Bulges**
Discard immediately. The can may have gas built up inside.

**Leaks**
Discard immediately. The can probably has a bad seal.



**Rusty**
Discard immediately. The can may be old.

**Dents**
Discard immediately. The can may have broken seams.



# Preparation and Cooking

Now you know how to safely receive and store food. But there are still several points in the flow of food at which food could become unsafe. One of those points is food preparation. **Food preparation** means cooking and preparing foods to be eaten. Remember that you need to cook certain foods, such as poultry and meat, to specific internal temperatures for them to be safe to eat.

Another way to keep food safe is to prevent cross-contamination and microorganism growth. Salads with cold protein, such as chicken salad, can be the perfect place for microorganisms to grow. Because raw and cooked foods are combined in these dishes, not all of the microorganisms will be killed by heat.

To avoid contamination during food preparation, use tongs or spatulas instead of your hands. Hands can carry bacteria. Always make sure equipment, tools, cutting boards, and other surfaces are cleaned and sanitized often. Keep foods covered whenever possible.

To avoid cross-contamination, wash all fresh fruits and vegetables before you prepare them. Wash root vegetables and starches, such as potatoes, before and after you peel them. Never prepare uncooked meats in the same area you use to prepare fruits and vegetables.

Each type of food product you prepare is at risk for a different kind of contamination. Know the risks for individual foods to prepare them safely for customers. (See **Figure 2.8**.)

## Hold Food Safely

In some foodservice establishments, foods may be cooked and served immediately. However, in other facilities, foods must be prepared ahead of time. Foods are then held on a steam table for service. The process of keeping foods warm or cold before serving them is called **holding**. For example, you might prepare a bean soup for lunch that will be served over a three-hour lunch period. The soup would need to be held at the right temperature for service.

## Holding Guidelines

It is important to learn how to hold foods properly. Foods are at risk for microorganism growth during holding. These general guidelines can help you hold food safely:

- Keep foods covered to reduce the risk of contamination.
- Take the internal temperature of held food regularly. This should be done a minimum of every two hours.
- Hold cooked foods at 135°F (57°C) or above. If the temperature drops below 135°F (57°C), reheat the food to 165°F (74°C) for 15 seconds within two hours. Hold it again at 135°F (57°C). If the temperature drops below 135°F (57°C) for a second time, discard the food.
- Hold cold foods at 41°F (5°C) or below.
- Stir hot foods regularly.
- Do not warm up cold foods by placing them directly into a steam table. This can encourage bacteria to grow.
- Never mix a fresh batch of food with food that has been in holding. Discard food after it has been held for four hours.

**Color Coding** You can help prevent foodborne illness with color-coded cutting boards. *Why would color-coded cutting boards be useful to prevent foodborne illness?*

**FIGURE 2.8 Food Prep**

**Prepare Foods** Food preparation is a point in the flow of food at which food must be kept safe. *At what other points should food be kept safe?*

| General Preparation and Cooking Guidelines |
| --- |
| Use clean, sanitized cutting boards, knives, and tools. |
| Do not remove all the food from the refrigerator at one time. Work with only as much product as you will need for one hour. |
| Always prepare produce in a separate area from raw meats, poultry, eggs, or fish. |
| Clean and sanitize knives each time you prepare a different food product. |
| Do not let food sit on the counter. Prepare or cook it immediately, and then return what is left to storage. |
| Keep cold ingredients properly chilled in the refrigerator until you need them. |
| Fully cook protein foods, such as chicken, before you mix them with other food products. |
| Closely follow recipe directions when preparing foods. |
| Cook food to the proper minimum internal temperature. |
| Do not mix leftover foods with freshly prepared foods. |
| Reheat leftover sauces and gravies to 165°F (74°C) for 15 seconds before serving them. |
| Thoroughly cook foods that have been battered or breaded. |

- Do not store cold foods directly on ice. Put the food in a storage container and then set the container into the ice until the food and the ice are at the same level in the container.

## Serve Food Safely

You may remember that people are the main cause of cross-contamination in foods. When food is served, the chances of contamination are high. It is important to learn standard operating procedures about how foods should be served so that they remain safe.

### Serving Guidelines

Every foodservice facility should have serving guidelines. All foodservice workers at the foodservice facility should follow these guidelines at this important step in the flow of food:

- Never touch ready-to-eat food with your bare hands.
- Never touch the surfaces of glasses, plates, or utensils that will come into contact with food or beverages. Instead, hold dishes by the bottom or an edge; hold cups by their handles; hold glasses by the lower third of the glass; and hold forks, knives, and spoons by their handles.
- Never allow one plate of food to overlap onto another plate of food.
- Use scoops to pick up ice. Never use your hands. Store scoops seperately from ice.
- Cleaning cloths should be used only for cleaning.

## Cool Food Safely

The FDA recommends a two-stage method to cool food safely. In the first stage, cooked foods are cooled down to 70°F (21°C) within two hours. In the second stage, cooked foods are cooled down below 41°F (5°C) within four

**FIGURE 2.9 Kitchen Sanitizers**

**Sanitizers for Surfaces** There are several sanitizers that can be safely used in the professional kitchen. Many are diluted, or mixed, with water before use. *Why do you think it is important to dilute these products properly?*

| Type of Sanitizer | Amount to Use | How to Use |
|---|---|---|
| **Chlorine** | 1 tsp. per gallon | Soft or hard water at 75°F (24°C) |
| **Iodine** | 2 Tbsp. per 5 gallons | Hard water between 75°F–120°F (24°C–49°C) |
| **Quaternary Ammonia** | About 1 tsp. per gallon | Soft water at 75°F (24°C) |

hours. This two-stage method takes six hours. Some facilities use a one-stage, four-hour method. In the one-stage method, foods are cooled down below 41°F (5°C). Check with local standards for cooling methods.

Refrigerators are not designed to cool hot foods. They are designed to hold cooled foods at cold temperatures. Remember that the more dense a food is, the slower it will cool. Shallow stainless steel pans allow food to cool quickly.

## Reheat Foods Safely

Reheating cooked foods must be done carefully. Foods must be reheated so that they keep a minimum internal temperature of 165°F (74°C) for 15 seconds. Foods should be reheated within two hours of reaching 41°F (5°C). If you add a previously cooked food to another food, such as tomato sauce to spaghetti, the whole mixture must be reheated to a minimum internal temperature of 165°F (74°C).

**Reading Check** **Define** What is the definition of holding food?

# Disposal Point

The last stop in the flow of food is the disposal point. The **disposal point** is the point at which food remaining after being eaten is disposed of properly. Cleaning and sanitizing are the key actions to take at the disposal point. Dishes, glasses, cups, utensils, and equipment must be cleaned and sanitized.

The first step is to scrape leftover food from dishes, equipment, tools, and glasses into the garbage can. Then, the dish or tool should be rinsed over the sink's garbage disposal unit before it is washed. Most foodservice operations use a combination of commercial sinks and dishwashers to clean and sanitize dishes, cookware, and utensils. Chemical sanitizers are used in both sinks and dishwashers to keep bacteria from growing. (See **Figure 2.9**.)

## Waste Disposal

It is very important to throw away waste properly. Harmful bacteria can easily grow in garbage, and pests are attracted to it. Garbage should be disposed of in proper containers. It should never be left on counters. Garbage containers should be cleaned and sanitized every day. A fresh liner should be used every time garbage is taken out. Garbage should be taken out as soon as the container is full, and at the end of the day. Always wash your hands properly after taking out the garbage.

### Recycling

A recycling program can help improve the environment. To **recycle** is to take a product at the end of its use and turn it into a raw material to make a different product. Some products that can be recycled include paper, glass, aluminum, steel, and some forms of plastic.

To start a recycling program at a foodservice establishment, you must first decide what you will recycle. Then, set aside storage containers for different types of recyclable items, and separate items (glass, plastic, and aluminum, for example). Rinse all items to be recycled so they do not attract pests.

## Manual Dishwashing

A three-compartment commercial sink is used for manual dishwashing. (See **Figure 2.10**.) **Manual dishwashing** is washing dishes, glasses, cookware, and utensils by hand. You must first scrape and prerinse dishes. Next, wash them in at least 110°F (43°C) water and detergent. Hold glasses upside down over the center brush in a dishwashing sink, and rotate the glass back and forth. Then, rinse the dishes with clear water at 110°F (43°C). Change the water as needed to keep it clear and hot. Sanitize items in at least 171°F (77°C) water for 30 seconds. Some health codes require 180°F (82°C) water for sanitizing. When sanitizing with chemical solutions, follow the manufacturer's directions for proper concentration and water temperature. Remove the items and allow them to air dry. Store the items in a clean, dry area.

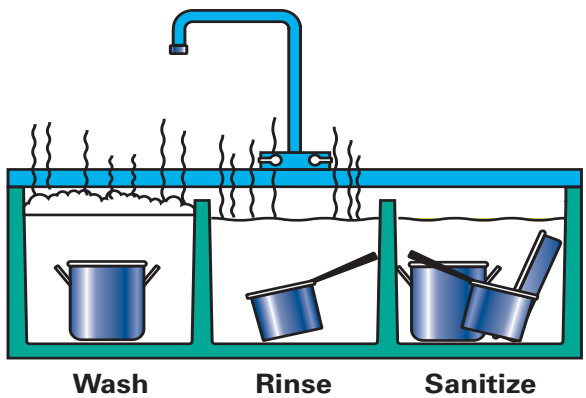



**FIGURE 2.10 Three-Compartment Sinks**
**Wash, Rinse, Sanitize** A three-compartment sink is used to wash, rinse, and sanitize dishes. *What factors should you consider when you use a three-compartment sink?*

### Scrubbing and Scouring

To clean pots, pans, cooking tools, forks, knives, and spoons, follow the manual dishwashing procedures described above. Never use steel wool or metal scouring pads on small tools. This can cause nicks and scratches. Bacteria can hide and multiply in these scratches. In addition, steel wool fragments may remain on pots or pans, creating a physical hazard if they make their way into food. Sponges should not be used because they are great hiding places for harmful bacteria.

## Commercial Dishwasher Use

Foodservice operations clean and sanitize a lot of dishes during a single day. Dishes can be cleaned by hand. However, this can take a large amount of time and resources. It is much more efficient for restaurants to use commercial dishwashers.

There are many types of commercial dishwashers:

- **Single-compartment** dishwashers have one compartment for all dishes and utensils.
- **Multi-compartment** dishwashers have more than one compartment.
- **Recirculating** dishwashers recycle prewash water through the dishes to save water and energy.
- **Conveyor** dishwashers clean dishes in racks on a belt that moves through the machine.
- **Door-model**, or stationary rack, dishwashers have a large front door to load dishes, and can wash many dishes at one time.

### Dishwasher Guidelines

These general guidelines should be followed when using a commercial dishwasher:

- Scrape and rinse soiled dishes and presoak utensils and tools.
- Prerinse dishes to remove food and soil.
- Rack dishes, glasses, and utensils so that water will spray all of the surfaces. Glasses should be placed upside-down.

## Dry and Store Items

How you dry and store dishes and glasses will determine whether they will stay clean and sanitary. You must follow a procedure to keep from contaminating the sanitized dishes and glasses.

Allow clean, sanitized dishes to air dry. Do not touch dish surfaces that will come in contact with food once they have been cleaned, sanitized, and dried. Wash your hands before you store items in a clean, dry area. All dishes should be completely dry before they are stacked and stored. Water that is left on dishes can become a breeding ground for bacteria, mold, and other disease-causing microorganisms. Do not stack dishes or glasses too high on storage shelves. This can create a safety hazard if they become unbalanced and fall.

**Reading Check** **Determine** When should garbage be taken out?

**Doing Dishes** Dishes should be thoroughly washed and sanitized each time they are used. *Why do you think that dishes should be air-dried instead of dried with a towel?*

## SECTION 2.3 After You Read

### Review Key Concepts

1. **Explain** how to receive and store dry and canned goods.
2. **Describe** how to reheat foods safely.
3. **Identify** the steps that must be taken before running a dishwasher.

### Practice Culinary Academics

#### Science

4. **Procedure** Follow your teacher's instructions to form small groups. Prepare two servings of a cooked vegetable dish. Carefully follow the chapter's advice for storing one serving. Store the other serving in a way that would be unsafe. The next day, compare the two dishes by sight and smell, but do not eat them.

   **Analysis** Record your observations and make conclusions storing cooked vegetables.

**NSES F** Develop an understanding of personal and community health.

#### Mathematics

5. You are holding a pot of gravy for service. At 6:00 p.m., its temperature measures 143.2°F. At 7:00 p.m., its temperature reads 136.1°F. At 8:00 p.m., its temperature reaches 141.6°F. What is the gravy's range of temperatures?

   **Math Concept** **Calculating Range** Range is a statistical measure indicating the distance between the greatest and least numbers in a set of numbers. To calculate range, subtract the lowest value from the highest value.

   **Starting Hint** Determine which of the three recorded temperatures is the highest, and which of the three is the lowest. Subtract the lowest temperature from the highest temperature to find the gravy's range of temperatures.

**NCTM Data Analysis and Probability** Select and use appropriate statistical methods to analyze data.

Check your answers at this book's Online Learning Center at **glencoe.com**.

CHAPTER 2

# Review and Applications

## Chapter Summary

To ensure food safety and quality, foodhandlers must follow procedures that promote a clean and healthy workplace. This starts when they get ready for work and lasts until their work shift is over. Foodhandlers must be in good physical health to work. They must practice good grooming habits. The HACCP system helps minimize hazards and ensure food safety in a professional kitchen. All food products must be inspected carefully, stored quickly and properly, monitored while in storage, prepared carefully, and disposed of properly.

## Content and Academic Vocabulary Review

**1.** Create a fill-in-the-blank sentence for each term, with enough information to determine the missing word.

### Content Vocabulary

- foodhandler (p. 26)
- hygiene (p. 26)
- chef's coat (p. 26)
- protective clothing (p. 26)
- hair restraint (p. 26)
- hand sanitizer (p. 27)
- flow of food (p. 31)
- HACCP (p. 31)
- critical control point (p. 32)
- minimum internal temperature (p. 33)
- food thermometer (p. 34)
- calibrate (p. 35)
- record-keeping system (p. 35)
- log (p. 36)
- receiving (p. 38)
- storage (p. 38)
- shelf life (p. 38)
- first in, first out (p. 38)
- shucked (p. 39)
- processing (p. 40)
- pasteurize (p. 40)
- produce (p. 41)
- perishable (p. 41)
- food preparation (p. 42)
- holding (p. 42)
- disposal point (p. 44)
- recycle (p. 44)
- manual dishwashing (p. 45)

### Academic Vocabulary

- provide (p. 26)
- technique (p. 27)
- improved (p. 31)
- verify (p. 36)
- ideal (p. 38)
- affect (p. 38)

## Review Key Concepts

**2.** **Demonstrate** appropriate personal hygiene for the workplace.

**3.** **Illustrate** proper personal health practices to avoid the spread of foodborne illness.

**4.** **Explain** the purpose of the HACCP system.

**5.** **Outline** the processes of monitoring, corrective action, record keeping, and verification.

**6.** **Summarize** the steps in safely receiving and storing food.

**7.** **Identify** safe holding, serving, cooling, and reheating guidelines.

**8.** **Explain** how to properly clean, sanitize, and store dishes and glassware.

## Critical Thinking

**9.** **Explain** what you should do if you are preparing a sauce and you find that someone's hair has fallen in the sauce.

**10.** **Evaluate** record keeping. Why is detailed and accurate record keeping an important part of the HACCP system?

CHAPTER 2

# Review and Applications

## Academic Skills

### English Language Arts

**11. Develop a Disposal Procedure** An effective workplace procedure must be clear enough for employees to understand so that they follow it correctly. Create a procedure for disposing of food and washing dishes, and write it out in a step-by-step or checklist form that employees could use to follow the procedure.

**NCTE 12** Use language to accomplish individual purposes.

### Social Studies

**12. Hygiene History** Research the history and development of an aspect of food safety, for example, hand-washing, foodborne illness, or food storage. Write a report that details the development of your topic and that answers the following questions: How were the hazards discovered and solutions developed? How has human health improved as a result of these changes, both in the workplace and at home?

**NCSS VIII B Science, Technology, and Society** Make judgments about how science and technology have transformed the physical world and human society and our understanding of human-environment interactions.

### Mathematics

**13. Calculate Volume** You have cooked a pot of soup for tomorrow's lunch. Following proper cooling guidelines, you would like to transfer the contents of the full 12-quart (693-cubic-inch) pot of hot soup into smaller containers for cooling. Each rectangular-shaped container is 12 inches long, 10 inches wide, and 2 inches deep. How many smaller containers will you need to hold all of the soup?

**Math Concept** **Calculating the Volume of a Box** Volume is the amount of space inside a solid object. The volume of a box (or a rectangular three-dimensional shape) is obtained by multiplying its length times its width times its height (or depth).

**Starting Hint** Calculate the volume in cubic inches of one container by multiplying its length (12 inches) by its width (10 inches) by its height (2 inches). Then, divide this number into the volume of soup (693 cubic inches) to determine the number of containers needed. Round up to the next whole number.

**NCTM Geometry** Use visualization, spatial reasoning, and geometric modeling to solve problems.

## Certification Prep

*Sharpen your test-taking skills to improve your kitchen certification program score.*

**Directions** Read the questions. Then, read the answer choices and choose the best possible answer for each.

**14.** The temperature danger zone is:

- **a.** 41°F to 135°F.
- **b.** 40°F to 140°F.
- **c.** 32°F to 212°F.
- **d.** 41°F to 70°F.

**15.** Food safety begins during:

- **a.** receiving
- **b.** storage
- **c.** preparation
- **d.** holding for service

### Test-Taking Tip

Come up with the answer in your head before looking at the possible answers. You will be more confident in your answer, and avoid being tricked.

CHAPTER 2

# Review and Applications

## Real-World Skills and Applications

### Time Management Skills

**16.** **Get Ready for Work** Imagine that you are a line cook in a restaurant. Your job requires you to be ready to begin work exactly at the start of your shift. You have one hour between school and work to get ready. Create a schedule to help you prepare for work. Include all activities for getting ready on your schedule.

### Civic Responsibility

**17.** **Customer Service** Imagine that you are the manager of a restaurant that has had a recent outbreak of foodborne illness. One of your regular customers who has not been ill is concerned. Assume you have an HACCP system set up in your restaurant. How would you speak to the customer? Role-play your responses in class.

### Technology Applications

**18.** **Make a Spreadsheet** Create a spreadsheet that could serve as a checklist for kitchen employees to check tasks as they work. Identify the critical control points, and underneath each create a list of the critical actions that will minimize the risk of food contamination.

### Financial Literacy

**19.** **Dishwashing Options** Commercial dishwashers cost $4,000 and take one person to run. Dishwashing by hand requires three employees. Employee dishwashers earn a wage of $7.25 per hour. If employee dishwashers work 8 hours per day, how long will it take for a commercial dishwasher to become more cost-effective than manual dishwashing?

## Culinary Lab

*Use the culinary skills you have learned in this chapter.*

### *Your HACCP System*

**20.** **Create an HACCP System** In this lab, you will follow your teacher's instructions for forming teams. Working in teams, you will create an HACCP system for the commercial kitchen pictured on page 33, using the HACCP critical control points on page 31 as your guide.

**A. Find the problems.** As a team, determine the potential control point problems in each of the following areas on the diagram: receiving food, storing food, preparing and cooking food, holding food, and serving food. Create standard operating procedures for this kitchen.

**B. Create a poster.** Develop a poster that explains your team's solutions to the problems you have identified. Have your teacher approve the team's poster.

**C. Check your foods lab.** Inspect your foods lab using your team's HACCP inspection system poster. Note any areas that might need improvement.

**D. Report to the class.** Report your team's findings to the class.

**E. Lead a discussion.** Discuss each team's food lab inspection and poster recommendations. Analyze what they illustrated about the role of the HACCP system in keeping food safe.

### Create Your Evaluation

Compare and contrast the systems and procedures of each team. Which systems and procedures were most effective? Thinking about each team's system and results, answer the following questions:

1. If you were designing a new system, would you change the way you look for critical control points? Why?
2. How can you be a better foodservice employee after this experience?

CULINARY CAREER
*Spotlight*

# Research and Development

***Have you ever wondered how the food products you eat are created?***

Food manufacturers look for practiced chefs and foodservice workers to help develop new packaged, frozen, canned, semi-prepared foods and other food products. There are a variety of research and development careers that can be found in every part of the country.

To succeed in research and development, you will need a culinary degree and a basic understanding of food science. You will also need excellent oral and written communication skills and work experience.

## Patrick Sullivan, RD, LDN, Metabolic Kitchen Nutritionist

**Q Describe your job.**

**A** I am a metabolic kitchen nutritionist for Johns Hopkins School of Medicine. I perform nutrition-related research studies that help form more effective diets for patients with nutritional complications. I am currently working on the first major American study of the Glycemic Index.

**Q Why did you choose your career?**

**A** I originally thought I would get a Culinary Arts degree, but I quickly changed to Culinary Nutrition after I took a class in Nutrition and Sensory Analysis. We had to take traditional recipes and modify them to meet a healthier diet. I loved how it was like solving a puzzle.

**Q Describe a typical work day.**

**A** Most of my days are spent performing day-to-day kitchen operations, such as cooking, purchasing, and receiving food. A large part of my job is quality control. Each participant's diet has been calculated and is carefully weighed to meet his or her needs. The diets that are created at this facility will one day be used as a model for hospitals around the country.

**Q What training and preparation did you receive?**

**A** I graduated with a bachelor's degree in Culinary Nutrition. I learned about cooking theory and techniques in my first two years. My last two years prepared me for nutrition from both a culinary and a clinical angle.

**Q How has your education helped you?**

**A** Every day I use the skills that I learned in school. Now I enjoy great job satisfaction. If you enjoy work and take pride in what you do, that positive outlook fills your personal life.

**Q What skills do you need for your job?**

**A** You need to be strong in recipe development and foodservice management. You have to be able to present food demonstrations and research study findings. As a nutrition expert, you may need to know how to interview with media reporters.

| Career Ingredients | |
|---|---|
| **Education or Training** | Most employers require a culinary dietetics or food science degree, business and marketing courses, and restaurant experience. |
| **Academic Skills Required** | English Language Arts, Mathematics, Science |
| **Aptitudes, Abilities, and Skills** | Commitment to professional standards, creativity, teamwork, communication skills, and marketing, sales, and organizational skills. |
| **Workplace Safety** | Basic kitchen safety, sanitation, and food-handling rules must be followed. |
| **Career Outlook** | Openings will be plentiful in the near future as the foodservice industry continues to expand. |
| **Career Path** | Advancement depends on skill, training, and work experience. Chefs with management experience may move into research positions. |

| Career Pathways | |
|---|---|
| **Nutritionists** | Often help with the development of new food products. They identify the kinds and amounts of nutrients in foods. Some may help to develop consumer product statements. |
| **Directors of recipe development** | Create new recipes for a variety of menus. They must know many different food preparation techniques. |
| **Food batchmakers** | Set up food production equipment and modify recipes and formulas. They work to produce specific flavors or textures. They must have solid math and organizational skills. |
| **Food scientists** | Help produce, process, prepare, evaluate, and find different uses for food. They must have strong chemistry, biology, and psychology skills. |
| **Packaging specialists** | Develop packaging materials for specific food products. They must have strong skills in research, problem solving, and packaging equipment knowledge. |
| **Product development specialists** | Find ways to improve food products, such as better flavor or shelf life. They may also help develop new food products that meet quality standards. |
| **Quality assurance specialists** | Make sure foods meet quality, sanitation, and production standards. |
| **Research chefs** | Work with food scientists, manufacturers, and marketing departments to develop new food products. |

**Critical Thinking** What classes have you taken in school that might help you prepare for a career in food research and development?


Culinary certification programs include menu development and nutrition. Develop a new recipe for a healthful, flavorful sandwich using a variety of ingredients. Your recipe should contain a balance of different types of ingredients.


Imagine you are entering a sandwich-making competition. Prepare the sandwich recipe you created for the Get Certified practice, or a sandwich recipe of your teacher's choosing. You will be timed, and all food preparation must be done within that time. Evaluate your efforts based on the following rating scale:

1 = Poor; 2 = Fair; 3 = Good; 4 = Great

Judge your sandwich on:

- Whether you finished your recipe on time.
- The flavor and ingredients of the sandwich.
- The attractiveness of the plate, including any garnishes.