

Sample Chapter

GUIDE TO FOOD SAFETY

Third Edition


Updated to the 2009 FDA Food Code



SafeMark[™]
Supermarkets

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Learn How To:

- Identify potential problems related to temperature abuse of foods.
- Describe how to properly measure and maintain food temperatures to assure food temperatures have been controlled.
- Identify potential problems related to a food worker's poor personal hygiene.
- Explain how to improve personal hygiene habits to reduce the risk of foodborne illness.
- Identify potential problems related to cross contamination of food.
- Discuss procedures and methods to prevent cross contamination.

CHAPTER 3



**Factors
that Affect
Foodborne
Illness**

Employee Recognition Luncheon Goes Bad

The staff of the Aegean Rehabilitation Center was rewarded with an employee recognition luncheon. A party sized sub sandwich, prepared in the deli department of a local supermarket, was served. In the next 36 hours, those who ate the sandwich began to suffer nausea, vomiting, diarrhea, abdominal pain, and headache. Affected employees began to call in sick. Two days later, some of the residents from the Rehabilitation Center became ill with the same symptoms. The local health department became involved to try to identify the cause of the illness and implement measures to stop the outbreak.

Interviews of staff members who work at the rehabilitation center showed those individuals who had become ill had eaten the sub sandwich from the supermarket deli. The deli employee was wearing gloves when he prepared the sub, according to the supermarket manager.

The illness lasted about three days for many of those affected. The health department was suspicious this outbreak was caused by a highly contagious microbe. What do you think the problem might be and what measures were outlined to stop the progression of this disease?

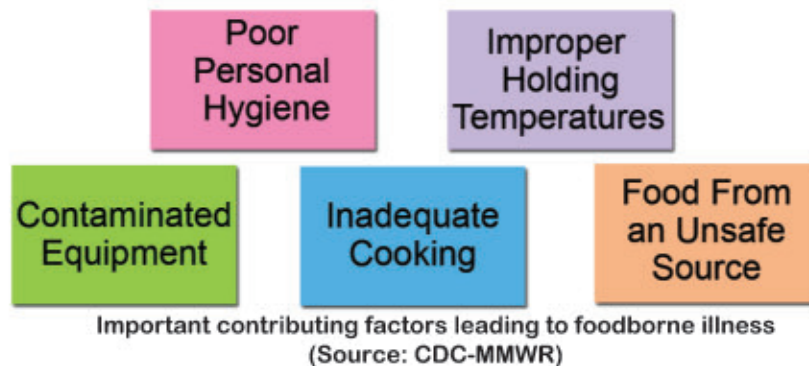
Essential Terms

Calibrate	Food temperature–measuring device
Centers for Disease Control and Prevention (CDC)	Personal hygiene
Cross contamination	Temperature abuse
Dial-faced bi-metal thermometer	Thermocouple
Digital thermometer	T-Stick type melt devices

Factors That Contribute to Foodborne Illness

The **Centers for Disease Control and Prevention (CDC)** is an agency of the federal government. One of the CDC's primary responsibilities is to collect statistics about diseases that affect people in the United States, including foodborne illness. CDC statistics show most outbreaks of foodborne disease occur because *food is mishandled*. Some of the major contributors to foodborne illness are presented on the next page.

All five of these factors are important types of food-handling errors that could lead to foodborne illness. A foodborne outbreak may be due to one or more of these contributing factors. Poor personal hygiene and improper holding temperatures are the most common causes of foodborne illness for retail food establishments. The use of good personal hygiene practices (i.e. hand washing) helps prevent the spread of viruses and bacteria. Control of



food holding temperatures (i.e., cooling and hot/cold holding) helps prevent the growth of bacteria in food. The CDC provides an estimate for the number of foodborne illnesses in the United States each year. A list of the seven most commonly found microorganisms and the estimated numbers of foodborne illness/per year are provided in the table below. For each of these organisms, common contributing factors leading to foodborne illness are provided. Note the most common microorganism associated with foodborne illness is the Norwalk-like virus, most often associated with poor personal hygiene practices.

Microorganism	Cases/Year
Norwalk-like virus	23,000,000
<i>Campylobacter</i> spp.	2,500,000
<i>Salmonella</i> spp.	1,400,000
<i>Clostridium perfringens</i>	250,000
<i>Staphylococcus aureus</i>	185,000
<i>Escherichia coli</i>	75,000
<i>Listeria monocytogenes</i>	2,500

Microorganisms leading to foodborne illness
in the United States
(Source: CDC-MMWR)

What Is Time and Temperature Abuse?

Controlling time and temperature is a very important way to assure food safety. Most cases of foodborne illness can, in some way, be linked to tem-

What Is Time and Temperature Abuse?



Controlling time and temperature is a very important way to assure food safety. Most cases of foodborne illness can, in some way, be linked to temperature abuse. As we learned in Chapter 2, **temperature abuse** is used to describe situations in which foods are:

- Exposed to temperatures in the temperature danger zone for enough time to allow growth of harmful microorganisms
- Not cooked or reheated sufficiently to destroy harmful microorganisms.



In Chapter 2, “Hazards to Food Safety,” you learned harmful microbes can grow in PHF (TCS) when temperatures are between 41°F (5°C) and 135°F (57°C), the temperature danger zone. Keep the internal temperatures, inside the core of a food item, out of the temperature danger zone [41°F (5°C) to 135°F (57°C)] to prevent harmful microbes from growing. Higher temperatures destroy microbes; however, toxins produced by microbes may not be destroyed by normal cooking temperatures.



The Temperature Danger Zone



Keep cold food temperatures below 41°F (5°C) and out of the temperature danger zone to prevent most microbes from growing. Bacteria that can grow at lower temperatures do so very slowly. Proper date marking of refrigerated ready-to-eat PHF (TCS) is necessary to prevent time abuse. There are unavoidable situations during food production when foods must pass through the temperature danger zone, such as:

- Cooking
- Cooling
- Reheating
- Food handling (slicing, mixing, and sandwich assembling).

During these activities, you must minimize the amount of time foods are in the temperature danger zone to control microbial growth. When it is necessary for a food to pass through the temperature danger zone, do it as quickly as possible. In addition, foods should pass through the danger zone as few times as possible.

Heating foods improves texture and flavor and also destroys harmful microorganisms. As you learned in Chapter 2, many raw foods naturally contain harmful microbes or can become contaminated during handling. When you cook and reheat foods properly, microbes are reduced to safe levels or are destroyed. *Cooking and reheating are two very important processes for safe food management.*




How to Measure Food Temperatures





Maintaining safe food temperatures is an essential and effective part of food safety management. You must know how to measure food temperatures correctly with a **food temperature-measuring device** to prevent temperature abuse. Thermometers, thermocouples, and other devices are used to measure the temperature of stored, cooked, cooling, hot-held, cold-held, and reheated foods. The following chart shows different types of thermometers and their features.

A food temperature-measuring device with a small diameter probe must be available to measure the temperature of thin foods, such as meat patties and fish filets.

An important rule to remember for avoiding temperature abuse is:

Keep Hot Foods Hot, Keep Cold Foods Cold, or Don't Keep the Food at All.

Thermometer	Features/Uses
<p data-bbox="193 205 561 269">Dial face, metal stem type (bi-metallic)</p>  <p data-bbox="214 524 547 547">Courtesy of Cooper Instrument Corp.</p>	<ul data-bbox="599 205 1180 560" style="list-style-type: none">● Most common type of thermometer used● Used to measure internal food temperature at every stage in the flow of food● Measures temperatures ranging from 0°F (-18°C) to 220°F (104°C) with 2°F increments● Stem of bi-metallic thermometer must be inserted at least 2 inches into the food item being measured.
<p data-bbox="193 624 288 651">Digital</p>  <p data-bbox="214 879 547 902">Courtesy of Cooper Instrument Corp.</p>	<ul data-bbox="599 733 1180 833" style="list-style-type: none">● Displays the temperature numerically● Measures a wider range of temperatures than a dial face thermometer.
<p data-bbox="193 951 400 979">Thermocouple</p>  <p data-bbox="214 1334 547 1357">Courtesy of Cooper Instrument Corp.</p>	<ul data-bbox="599 1115 1159 1324" style="list-style-type: none">● Provides a digital readout of the temperature● Has a wide variety of interchangeable probes● Sensing portion is often at the tip of the probe. <p data-bbox="1026 1461 1180 1488"><i>(Continued)</i></p>

<p>Thermometer</p>	<p>Features/Uses <i>(Continued)</i></p>
<p>Infrared</p>  <p>Courtesy of Raytek Corporation</p>	<ul style="list-style-type: none"> ● Measures the surface temperature of food without actually touching the food (reduces the chance of cross contamination) ● Requires about 20 minutes to adjust after use for hot and cold temperatures (“thermal shock”) before use ● Accuracy must be checked frequently.
<p>T-Sticks (melt devices)</p>  <p>Courtesy of T-Stick</p>	<ul style="list-style-type: none"> ● Measure only one temperature ● Change color when indicated temperature is reached ● Used to monitor food temperatures and to check sanitizing temperature in dishwashing machines.
<p>Built-in</p>  <p>RMC2 SP15</p>	<ul style="list-style-type: none"> ● Used to monitor air temperature in refrigerated and frozen cases.
<p>Maximum Registering (holding)</p>  <p>Courtesy of DeltaTRAK, Inc.</p>	<ul style="list-style-type: none"> ● Used to measure the temperature of hot water used to sanitize items in mechanical dishwashing machines <p style="text-align: right;"><i>(Continued)</i></p>

Thermometer	Features/Uses <i>(Continued)</i>
Thermometer Guidelines:	<ul style="list-style-type: none"> ● Temperature-measuring devices typically measure food temperatures in degrees Fahrenheit (denoted as °F), degrees Celsius (denoted as °C), or both. ● Food temperature-measuring devices scaled only in Celsius or dually scaled in Celsius and Fahrenheit must be accurate to $\pm 1.8^{\circ}\text{F}$ ($\pm 1^{\circ}\text{C}$). Food temperature-measuring devices scaled in Fahrenheit only must be accurate to $\pm 2^{\circ}\text{F}$. ● Mercury-filled and glass thermometers should not be used in food establishments. ● Clean and sanitize thermometers properly to avoid contaminating food that is being tested. This is very important when testing raw and then ready-to-eat food items. To clean and sanitize a food thermometer, wipe off any food particles, place the stem or probe in sanitizing solution for at least 5 seconds, then air-dry. ● When monitoring only raw foods, or only cooked foods being held at 135°F (57°C), wipe the stem of the thermometer with an alcohol swab between measurements.

When and How to Calibrate a Thermometer

Before you use a thermometer, you need to **calibrate** it or make sure it is working correctly. Calibrate means to compare and adjust with a known standard. Dial-faced, metal stem type (bi-metal) thermometers should be calibrated:



- Before first use
- At regular intervals
- If dropped or otherwise damaged
- If used to measure extreme temperatures
- Whenever accuracy is in question.

Calibrate dial-faced thermometers by the boiling point or ice point method. See specific directions for calibration as described in the follow-

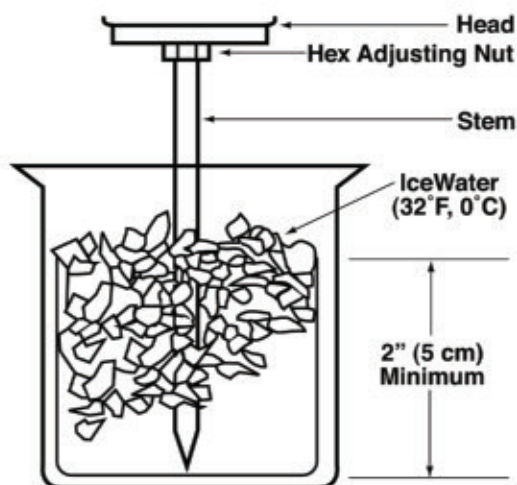
ing section. Use pliers or an open-ended wrench on the hex nut to adjust the indicator needle.

Boiling Point Method

Immerse at least the first 2 inches of the stem from the tip (the sensing part of the probe) into boiling water and adjust the needle to 212°F (100°C). At higher altitudes, the temperature of the boiling point will vary. Consult your local health department if you have any questions about the boiling point temperature in your area.

Ice Point Method

Insert the probe into a cup of crushed ice. Add enough cold water to remove any air pockets that might remain. Wait until the temperature stabilizes and adjust the needle to 32°F (0°C).



Calibration of a dial-faced thermometer using the ice point method

Source: Food Safety Inspection Service, U. S. Department of Agriculture, (www.fsis.usda.gov/Fact_sheets/kitchen_thermometers/index.asp) Nov. 1, 2009

Measuring Food Temperature

The sensing portion of a food thermometer is at the end of the stem or probe. On the bi-metal thermometer, the sensing portion extends from the tip to the “dimple” mark that is typically 1 inch up the stem. An average of the temperature is measured over this distance. The sensing portion for digital and thermocouple thermometers is closer to the tip of the probe.

Accurate readings are only possible when the sensing portion of the temperature-measuring device is inserted deeply into the food. For bi-metal thermometers, immerse the needle tip at least 2 inches into the food to be

measured. For digital and thermocouple thermometers, the tip must be inserted 1 inch or more. Always insert the sensing element of the thermometer into the center or thickest part of the food. When possible, stir the food before measuring the temperature.



Insert the probe at least 2 inches into the product.

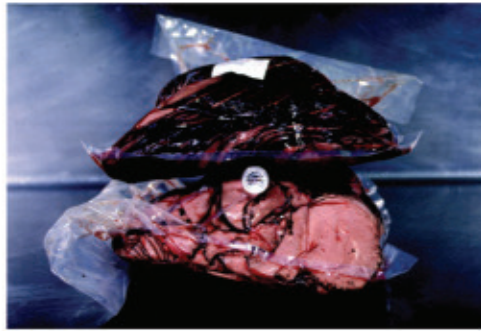


Measure the temperature of packaged salads with an infrared thermometer.



Wait for the temperature to stabilize before removing probe.

The approximate temperature of packaged foods can be measured accurately without opening the package. Place the stem or probe of the thermometer between two packages of food or fold the package around the stem or probe to make good contact with the packaging.



Place thermometer between packages of prepared foods to measure temperature.


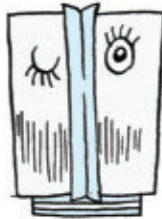


How to Accurately and Safely Measure Food Temperatures:

- Use an approved temperature-measuring device that measures temperatures from 0°F (-18°C) to 220°F (104°C).
- Locate the sensing portion of the measuring device.
- Calibrate the measuring device using the ice or boiling point method.
- Clean and sanitize the probe of the temperature-measuring device according to procedure.
- Measure the internal temperature of the food by inserting the probe into the center or thickest part of the item, at least 2 inches for a dial thermometer and 1 inch for digital thermometers.
- Always wait for the temperature reading to stabilize.

Preventing Temperature Abuse







Controlling temperatures of PHF (TCS) is important in almost all stages of food handling. Measuring temperatures of PHF (TCS) is an important responsibility for all food handlers. The following chart lists safe temperature guidelines for working with food throughout the flow of food. Each of these guidelines will be discussed throughout the remainder of this book.

Time and Temperature		
Receiving and Storing:		
 <p>Frozen and refrigerated receiving/storage practices prevent or slow the growth of harmful microorganisms</p>		
Food Product	Internal Temperature	
Frozen Foods	Solidly frozen	
Refrigerated Foods	41°F (5°C) or lower	
Raw Shell Eggs	45° F (7° C) ambient temperature or below	
		
Thawing:		
 <p>Take food from frozen to nonfrozen to minimize the product's time in the temperature danger zone. Keep PHF (TCS) below 41°F (5°C) at all times.</p>		
Method	Internal Temperature	Times
In refrigerator	41°F (5°C) or lower	typically takes 2-3 days
Submerged under cool running water 70°F (21°C)	Ready-to-eat product not to exceed 41°F (5°C); Water temperature not to exceed 70°F(21°C)	Thawed portions of raw animal foods requiring cooking should not be allowed to rise above 41°F (5°C) for more than 4 hours, including the time the food is being thawed and prepared for cooking.
Cooking:		
 <p>Safely heating a food product from raw to ready-to-eat with minimum holding times before serving</p>		
Food Product	Minimum Internal Temperature	Times
*Meat Roast (rare)	130°F (54°C) 140°F (60°C)	112 minutes 12 minutes
Meat and Pork (other than roast), Fish	145°F (63°C)	15 seconds
Ground Meat, Mechanically Tenderized Meat, Ground Pork, Ground Game Animals	155°F (68°C)	15 seconds
Meat Roast (medium), Pork Roast, Ham	145°F (63°C)	4 minutes
Poultry, Ground Poultry, Stuffed Meats, and Stuffed Food Products	165°F (74°C)	15 seconds

* See additional cooking times and temperatures in FDA Food Code - paragraph 3-401.11(B)(2)

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Time and Temperature (continued)		
Hot-Holding:		
Keeping hot food out of the temperature danger zone		
Food Product	Internal Temperature	
Hot-holding of all foods	135°F (57°C) or above	
Cold Food Holding:		
Keeping cold food out of the temperature danger zone		
Food Product	Internal Temperature	
Cold-holding of all foods	41°F (5°C) or below	
Cooling Hot Foods:		
Rapid reduction of temperature through and out of the temperature danger zone		
Part	Internal Temperature	Times
Hot food cooling part 1	From 135° to 70°F (57° to 21°C)	2 hours or less
Hot food cooling part 2	From 135° to 41°F (57° to 5°C) or below	Within 6 hours or less
Frozen Food Holding: Keeping food solidly frozen		
Food Product	Internal Temperature	
Frozen food	Solidly frozen recommended	
	Reheating: Bringing food back up to serving temperature	
Method	Internal Temperature	Times
Reheating	165°F (74°C) or above	Within 2 hours
Reheat commercially processed, intact packaged, ready-to-eat food	135°F (57°C) or above	Within 2 hours
Remember, there's NEVER been a case of foodborne illness that couldn't have been prevented!		

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Keep Cold Foods Cold and Hot Foods Hot!



Frozen foods should be kept solidly frozen until they are ready to be used. Freezing helps retain product quality. Proper frozen food temperatures do not permit disease-causing and spoilage microorganisms to grow. Cold temperatures also help preserve the color and flavor characteristics of food. Frozen foods can be stored for long periods of time without losing their wholesomeness and quality.

Refrigerated foods are held cold, but not frozen. Cold foods should be maintained at 41°F (5°C) or below. Do not forget that some disease-causing bacteria and many spoilage bacteria can grow at temperatures below 41°F (5°C), although their growth is very slow. By keeping cold foods at 41°F (5°C) or below, you can reduce the growth of most harmful microorganisms and extend the shelf life of the product. For maximum quality and freshness, hold cold foods for the shortest amount of time possible.



Deli salads are maintained at 41°F (5°C) or below.

Keep cold foods at 41°F (5°C) or below.

Improper holding temperature is an important factor that leads to foodborne illness.

Applying heat is another method used to preserve food. Heat food to proper temperatures to destroy harmful bacteria. Established safe cooking temperatures are based on the type of food and the method used to heat the product. Cooked foods, as well as those foods that have been cooled and then reheated, must be maintained at 135°F (57°C) or above until used. You must keep foods hot to stop the growth of disease-causing bacteria.

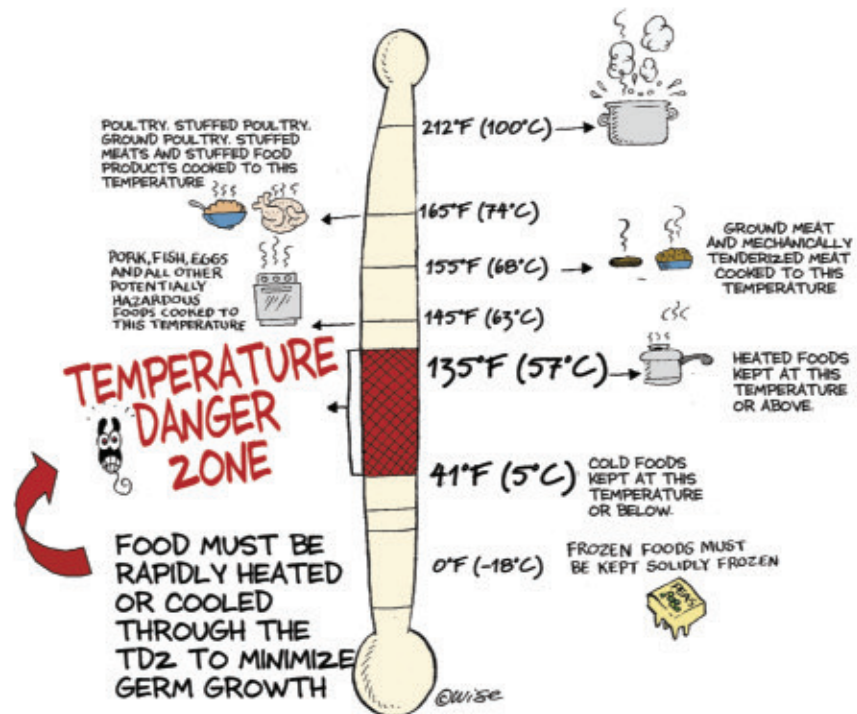
There are times during food production when foods must be in the temperature danger zone. Recognize the time spent in the temperature danger zone should be minimized for PHF (TCS) items.

Improper holding temperature is the No. 1 contributing factor that leads to foodborne illness. Spores of certain bacteria like *Clostridium botulinum*, *Clostridium perfringens*, and *Bacillus cereus* can survive cooking temperatures. Remember, if spores survive and are exposed to ideal conditions, they can again become vegetative cells and begin to grow in foods.

The *Food Code* contains cooling guidelines that permit foods to be in the temperature danger zone for a total of 6 hours. The FDA *Food Code* specifically states foods must be cooled from 135°F (57°C) to 70°F (21°C) in 2 hours, and from 135°F (57°C) to 41°F (5°C) or less within 6 hours.



To destroy many of the bacteria that may have grown during the cooling process, reheat foods to 165°F (74°C) within 2 hours to prevent the number of organisms from reaching levels that can cause foodborne illness.



Keep it hot, keep it cold, or don't keep it!



The preferred method for thawing foods is in the refrigerator at 41°F (5°C) or below. This prevents the food from entering the food temperature danger zone.

Other acceptable methods for thawing include using a microwave oven, as a part of the cooking process, or submerging under cool running water [70°F (21°C)] for a controlled amount of time. Proper thawing reduces the chances for bacterial growth, especially on the outer surfaces of food.

More detailed strategies for minimizing the amount of time a food is in the temperature danger zone during cooling, thawing, and food preparation are presented in the next chapter.

The Importance of Handwashing and Good Personal Hygiene



The cleanliness and personal hygiene of food employees are extremely important. If a food employee is not clean, the food can become contaminated. Good personal hygiene is essential for those who handle foods. Desirable behaviors include:

- Knowing when and how to properly wash hands
- Wearing clean clothing
- Maintaining good personal habits (bathing, washing and restraining hair, keeping fingernails short and clean, washing hands after using toilet, etc.)
- Maintaining good health and reporting when sick to avoid spreading possible infections.



Just think of all the things a food handler's hands touch during a typical work day. They may take out the trash, cover a sneeze, scratch an itch, or mop up a spill. When you touch your face or skin, run your fingers through your hair or beard, use the toilet, or blow your nose, you transfer potentially harmful germs to your hands. *Staphylococcus aureus*, Hepatitis A, Norovirus, and *Shigella* spp. are examples of pathogens that are commonly transferred to foods by bare hand contact. Proper handwashing helps remove visible hand dirt and the microorganisms it contains.



The CDC says handwashing is the single most important means of preventing the spread of infection. Personnel involved in food preparation and service must know how and when to wash their hands. Using approved cleaning compounds (soap or detergent), food employees must vigorously rub surfaces of fingers and fingertips, front and back of hands, wrists, and forearms for at least 10-15 seconds. Remember, soap, warm water, and friction are needed to remove bacteria and viruses from skin. A significant number of germs are removed by friction alone. A brush can be helpful when cleaning hands and under fingernails. However, the brush must be made of nonabsorbent materials and be kept clean and sanitary.

The entire handwashing process should take approximately 20 seconds.

When washing hands, thoroughly rinse under clean, warm running water and around fingernails and between fingers. Dry hands using a single-service paper towel, an electric hand dryer, or clean section of continuous rolled cloth towel (if allowed in your jurisdiction). Do not dry hands on your apron or a dish towel.

In addition to proper handwashing, fingernails should be trimmed, filed, and maintained so hand washing will effectively remove soil from under and around them. Unless wearing intact gloves in good repair, a food employee must not wear fingernail polish or artificial fingernails when working with exposed food.

According to the *Food Code*, hands shall be washed in a separate sink specified as a handwashing sink. An automatic handwashing facility may be used by food employees to clean their hands. However, the system must be capable of removing the types of soils encountered in the food operation. Food employees may not clean their hands in a sink used for food preparation or warewashing, or in a service sink used for the disposal of mop water and liquid waste. Hand antiseptic may be used by food employees in addition to handwashing. However, **hand antiseptic lotions must never be used as a replacement for handwashing.**

Always Wash Hands:

- Before food preparation
- After touching bare human body parts, except clean hands and clean exposed arms
- After using the toilet
- After coughing, sneezing, using a handkerchief or disposable tissue, using tobacco, eating, or drinking
- During food preparation when switching between working with raw foods and ready-to-eat products
- After engaging in any activities that may contaminate hands (taking out the garbage, wiping counters or tables, handling cleaning chemicals, picking up dropped items, etc.)
- After caring for or touching service animals or aquatic animals.



It is critical hand antiseptics be formulated with safe and approved ingredients because it is likely a food employee's hands will touch food, food-contact surfaces, or equipment and utensils after using the product.

Except when washing fruits and vegetables, food employees should not contact exposed ready-to-eat foods with their hands. Instead, they should use single-use gloves or suitable utensils, such as deli tissue, spatulas, and tongs.

SAFE HANDS...



1.
WET HANDS



2.
APPLY SOAP



3.
BRISKLY RUB
HANDS FOR
10-15 SECONDS



4.
SCRUB
FINGERTIPS
AND BETWEEN
FINGERS



5.
SCRUB FOREARM
TO JUST
BELOW ELBOW



6.
RINSE
FOREARMS
AND HANDS



7.
DRY HANDS
AND FOREARMS



8.
TURN OFF
WATER
USING PAPER
TOWEL



9.
TURN DOORKNOB
AND OPEN DOOR
USING PAPER
TOWEL



10.
DISCARD TOWEL

...MEAN SAFE FOOD

Proper handwashing technique

Complying with the “no bare hands” policy is especially important when handling food for sale to immunocompromised populations.

Food employees not serving immunocompromised populations may contact exposed, ready-to-eat foods with their bare hands if certain, specific conditions are met.

Examples are:

- The permit holder obtains prior approval from the regulatory authority.
- Written procedures are maintained in the food establishment and made available to the regulatory authority upon request.
- A written policy details how the food establishment complies with employee health requirements and documentation that food employees acknowledge they have received training in risks of contacting ready-to-eat foods with bare hands, proper handwashing, when and where to wash hands, and proper fingernail maintenance.

Food employees shall also minimize bare hand and arm contact with exposed food that is not in ready-to-eat form.

See 3-301.11 (D) of the *Food Code* for complete requirements and information.

Using Disposable Gloves

Retail food establishments sometimes allow their food employees to use disposable gloves as an extra barrier to help prevent contamination of foods. Gloves can protect food from direct contact by human hands. Gloves must be impermeable, meaning they do not allow anything to penetrate the porous texture of the glove. Use of gloves is often a good idea for foods handled extensively by hands, such as deli sandwiches or tacos, or when conducting food demonstrations. You must treat disposable gloves as a second skin. Whatever can contaminate a human hand can also contaminate a disposable glove. Therefore, hands should always be



Handwashing sink

washed prior to putting on a new pair of single-use gloves. For example, if food handlers are wearing disposable gloves and handling raw food, they must discard those gloves, wash their hands, and put on a fresh pair of gloves before they handle ready-to-eat foods. This procedure is very important in the seafood department and other areas where raw and ready-to-eat foods are handled and displayed.

Food handlers must not handle money with gloved hands unless they immediately remove and discard the gloves. Because money is handled and exchanged by human hands, it is often contaminated with bacteria. Employees must also wash their hands and put on a clean pair of gloves after they complete cleaning, mopping, and similar activities within their department.

If an employee removes gloves by rolling them inside out, the inner surface of the glove is very contaminated from his or her skin. Again, if you take disposable gloves off, throw them away. Never reuse or wash disposable gloves—always throw them away after each use.



1.
Wash Hands



2.
Select Gloves



3.
Put on Gloves



4.
Food Handling
Activity



5.
Discard Gloves
After Each Task



6.
Wash Hands When
Returning to Work

Proper use of disposable gloves

Personal Habits



Personal hygiene is related to health habits including bathing, washing hair, wearing clean clothing, and frequent hand washing. A food employee's fingers may be contaminated with saliva during eating and smoking. Saliva, sweat, and other body fluids can be harmful sources of contamination if they get into food.

Supervisors should enforce rules against eating, chewing gum, and smoking in food preparation, service, and warewashing areas. The *Food Code* permits food employees to drink beverages to prevent dehydration. The beverage must be in a covered container. The container must be handled in a way that prevents contamination of the employee's hands, the container, exposed food, equipment, and single-use articles.

Jewelry can harbor germs that cause foodborne illness, and it can fall into food causing a potential physical hazard. Therefore, food employees may not wear jewelry, including medical information jewelry, on their arms and hands while preparing food. The only exception to this policy is a plain ring such as a wedding band. Food employees should check with their supervisor to determine if their employer has additional restrictions on wearing jewelry during food production.

Outer Clothing and Apparel

Work clothes and other apparel should always be clean. The appearance of a clean uniform is more appealing to your customers.

Things You Can Do to Prevent Food Contamination:

- Wear clean clothing.
- If your clothing is contaminated, change into a new set of work clothes.
- Change your apron between working with raw foods and ready-to-eat foods. Aprons should be left in the department when going on break or to the restroom.
- Don't dry or wipe your hands on your apron.
- Wear a hat, hair coverings or nets, and beard restraints to discourage you from touching your hair or beard. These restraints also prevent hair from falling into food or onto food-contact surfaces.
- Keep in mind, however, protective apparel is similar to a disposable glove. They no longer protect food when contaminated.

Personal Health

In order to reduce the risk caused by ill food workers, the *Food Code* requires food employees and conditional food employees to report to the person in charge information about their health and activities related to the following disease-causing agents:



- Norovirus
- Hepatitis A Virus
- *Shigella* spp.
- Enterohemorrhagic or Shiga toxin-producing *Escherichia coli*
- *Salmonella* Typhi.

If a food employee or conditional food employee is directly or indirectly exposed to one of the disease agents listed above, it must be reported to the person in charge. All these diseases can potentially be transmitted by food and are considered severe health hazards.

Food employees and conditional food employees are also required to report to the person in charge when they are experiencing symptoms of gastrointestinal illness, such as vomiting, diarrhea, and jaundice, or a sore throat with fever. These employees must also report a lesion containing pus, such as a boil or infected wound that is open or draining and is located on the hands or wrists, exposed portion of the arms, or on other parts of the body unless the lesion is effectively covered and protected by an impermeable cover or tight-fitting bandage.



Food employees who have been exposed to any of these pathogens or organisms of concern must be excluded from work or be assigned to restricted activities having no food contact. In addition, food employees diagnosed with one of these diseases must not handle exposed food or have contact with clean equipment, utensils, linens, or unwrapped single-service utensils.

The person in charge shall notify the regulatory authority when a food employee is jaundiced or diagnosed with an illness due to one of the pathogens listed previously. In addition, the person in charge must assure a conditional employee who exhibits or reports a symptom or who reports



Sick employees cannot work with food.

being diagnosed with one of the pathogens listed previously is prohibited from becoming a food employee until the conditional employee meets the criteria for removal of exclusions and restrictions.

A detailed summary of reportable diseases; conditions that require exclusions and restrictions; and criteria for removal, adjustment, or retention of exclusions and restrictions for food employees and conditional food employees is provided in Appendix D of this book.

To date, there has not been a medically documented case of acquired immune deficiency syndrome (AIDS) transmitted by food. Therefore, AIDS is not considered a foodborne illness.

The Americans with Disabilities Act (ADA) prohibits discrimination against people with disabilities in jobs and public accommodations. Employers may not fire or transfer individuals who have AIDS or test positive for the HIV virus away from food-handling activities. Employers must also maintain the confidentiality of employees who have AIDS or any other illness.

Cross Contamination



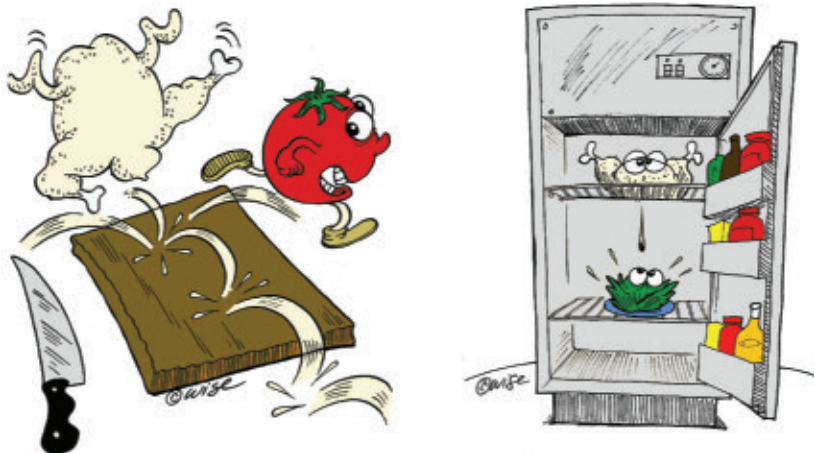
Contaminated food contains germs or harmful substances that can cause foodborne illness. The transfer of hazardous substances from one food item to another is called **cross contamination**. This commonly happens when germs from raw food are transferred to a cooked or ready-to-eat food via contaminated hands, equipment, or utensils. For example, bacteria from fish can be transferred to ready-to-eat seafood (such as cooked shrimp and imitation crab) in a display case where the products are not properly separated or by an employee's gloves. Cutting boards are also common vehicles for cross contamination. The leftover juices from raw chicken can lead to contamination of ready-to-eat salad items.

Cross contamination also happens when raw foods are stored above ready-to-eat foods. Juices from the raw product can drip or splash onto a ready-to-eat food. This poses a serious health risk because ready-to-eat items will not be cooked to destroy microorganisms prior to being eaten.



In a retail food establishment, germs can be transferred by a food employee, equipment and utensils, or another food. The following preventive measures can be used to eliminate the possibility of cross contamination between products:

- Always store cooked and ready-to-eat foods above raw products.
- Keep raw and ready-to-eat foods separate during storage.



Don't mix raw and ready-to-eat foods!

- Use good personal hygiene and handwashing.
- Keep all food-contact surfaces clean and sanitary.
- Avoid bare hand contact with ready-to-eat food.
- Keep different types of meat and poultry separate.
- Use separate equipment, such as cutting boards, for raw foods and ready-to-eat foods (color coding may be helpful for this task).
- Use clean, sanitized equipment and utensils for food production.
- Prepare ready-to-eat foods first—then raw foods.
- Prepare raw and ready-to-eat foods in separate areas of the establishment.



Use color-coded cutting boards for different types of foods.

Always keep raw foods separate from ready-to-eat foods. In the refrigerator, ready-to-eat foods must be stored above raw foods. Display cases, such as those used to display seafood items, should be designed to keep raw and cooked food items separate. In addition, separate buckets for in-place sanitizing solutions and wiping cloths should be used for cleaning food-contact surfaces in raw and ready-to-eat food production areas.

Other Sources of Contamination

Raw fruits and vegetables should be treated as ready-to-eat foods. Always wash these foods before use. Washing removes soil and other contaminants. Chemicals may be used to wash raw whole fruits and vegetables. These chemicals must be nontoxic and meet the requirements set forth in the *Code of Federal Regulations* (CFR) under Title 21 CFR 173.315.

Utensils used to dispense and serve foods can also be a source of food contamination. Utensils should be properly labeled to identify the type of food they are used to dispense. During hot- or cold-holding of foods, the utensil should be stored in the food. This helps to prevent contamination from employees or customers in self-service areas. It also keeps the utensil that contains food out of the temperature danger zone. The dispensing utensils (scoops) for ice and dry bulk foods should be clean and kept in an area protected from contamination. Scoops or tongs used in customer service areas also need to be labeled and kept clean.

Customer self-service areas for bakery items and candy are becoming more popular. Contamination by food allergens, such as peanuts, has occurred in these areas. Be sure the scoop used for peanut butter cups is not used for hard candies. To assure dispensing utensils are used for the intended foods, many retail food establishments will attach the dispensing utensil to the display case with a cable or chain.

Animals are not allowed in retail food establishments unless they are being used for support or special service (i.e., guide dogs for the blind). It is very important food handlers do not touch animals during food preparation and service. If employees should touch an animal for any reason, they must



Attach utensils to self-service display cases.



Wash hands or change gloves after touching live animals, such

wash their hands before returning to work. For example, if you should remove a live lobster from a tank for sale, you should change your gloves and/or wash your hands properly.

Germs from an employee's mouth can be transferred to food when the employee uses improper tasting techniques. A food employee may not use a utensil more than once to taste food that is to be sold or served.

Animals, rodents, and pests are common sources for food contamination. Rodents and pests usually enter retail food establishments during delivery when doors are left open or when garbage facilities are not properly maintained. A good integrated pest management (IPM) program should be established and maintained in every retail food establishment. You will learn about IPM programs in Chapter 7, "Environmental Sanitation and Maintenance."



Avoid contamination from other sources.

Make Sure the Work Area Is Clean and Sanitary



Anything that comes in contact with food must be clean and sanitary. This includes human hands, equipment, utensils, storage and holding areas, and self-service areas for customers. To protect food from contamination, effective cleaning and sanitizing procedures must be implemented and monitored. The goal of cleaning is to remove visible soil. The goal of sanitizing is to reduce the number of harmful microbes that may be present on a clean surface. Chapter 6 of this book is dedicated to describing different elements of cleaning and sanitizing programs. While cleaning and sanitizing are important in all areas of a retail food establishment, they are especially critical in areas where ready-to-eat foods are handled and displayed.

Summary

Back to the Story . . . The source of the infection was traced back to the sub sandwich prepared at the supermarket deli. The employee who prepared the sandwich had come to work just hours after his own bout of nausea, vomiting, and diarrhea had subsided. He was observed using poor glove technique (did not change gloves after going to the restroom). Norovirus was identified as the microbe that caused the outbreak. Highly contagious, this virus is passed on through stool and vomit. Poor personal hygiene and improper hand-washing spreads the virus.

The supervisor conducted a training session to demonstrate how to use gloves properly, good handwashing technique, and when to return to work after a gastrointestinal illness. The problem of Norovirus in a healthcare facility is serious because patients with lowered immune systems are at risk for a severe illness, even death. People infected with the Norovirus are contagious from the moment they begin feeling ill until at least three days after recovery. Therefore, it is very important for people to use good handwashing and other hygienic practices all the time to prevent Norovirus and other microbes from being transmitted to others. Food workers that are diagnosed with disease from Norovirus are not permitted to work until they are medically cleared.

- ✓ Temperature abuse can occur during receiving, storing, cooking, cooling, reheating, hot-holding, and cold-holding of foods. Depending on the food type, there are specific temperature requirements to assure food safety. These requirements are discussed in the next chapter. A good rule to follow in any retail food establishment is, “Keep It Clean! Keep It Hot! Keep It Cold! Or Don’t Keep It!”
- ✓ Food employees should always use good health and hygiene practices. Clean clothing, hair restraints, and proper handwashing practices are fundamental in safe food management. Effective supervision and enforcement of proper procedures form the foundation of a successful food operation.
- ✓ Control cross contamination with proper cleaning and sanitizing. Avoid cross contamination from one food to another. Keep foods separate and store raw foods below cooked and ready-to-eat foods. Always use proper food-handling techniques.

- ✓ Keep foods at proper temperature, use good personal hygiene, and control contamination and cross contamination. These are the essentials of safe food management.

Almost All Foodborne Illnesses Are Linked To:

- Improper holding temperature
- Poor personal hygiene
- Contaminated equipment
- Inadequate cooking
- Food from an unsafe source.



Discussion Questions (Short Answer)

1. How frequently should thermometers be calibrated? Describe the two methods for calibrating food thermometers.
2. Under what conditions are foods “time and temperature abused”?
3. What is meant by poor personal hygiene, and how can this lead to foodborne illness?
4. What does the term *cross contamination* mean?
5. Why are cleaning and sanitizing important?

Quiz 3 (Multiple Choice)

Choose the **best** answer for each question.

1. Packages of luncheon meat kept at temperatures above 50°F (10°C) for more than 6 hours are:
 - a. safe to eat.
 - b. cross contaminated.
 - c. time and temperature abused.
 - d. adulterated.
2. Good personal hygiene includes:
 - a. using hand antiseptics instead of handwashing.
 - b. keeping hands and clothes clean and sanitary.
 - c. wearing attractive uniforms.
 - d. cleaning and sanitizing food-contact surfaces.

3. Before changing to ready-to-eat foods, a cutting board used to cut up raw chicken must be:
 - a. cleaned and sanitized.
 - b. turned over to use the other side.
 - c. dried thoroughly with a paper towel.
 - d. rinsed in cool running water.
4. After proper cooking, all foods that are to be held hot must be held at:
 - a. 165°F (74°C) or above.
 - b. 135°F (57°C) or above.
 - c. room temperature until served.
 - d. 120°F (49°C) or above.
5. After proper cooking, all foods that are to be held cold must be:
 - a. cooled quickly and held at 41°F (5°C) or below.
 - b. cooled quickly and held at 70°F (21°C) or above.
 - c. stored at room temperature until served.
 - d. cooled slowly and held at 50°F (10°C) or below.
6. The No. 1 contributing factor leading to foodborne illness in retail food establishments is:
 - a. improper holding temperature of foods.
 - b. cross contamination.
 - c. poor personal hygiene.
 - d. inadequate cleaning and sanitizing programs.
7. Foodborne illness can be caused by:
 - a. poor personal hygiene.
 - b. cross contamination.
 - c. temperature abuse.
 - d. All of the above.
8. Regarding food thermometers, which statement is **false**?
 - a. They should be calibrated.
 - b. They should measure temperature between 41°F and 135°F (5°C and 57°C).
 - c. They should measure temperature between 0°F and 220°F (-18°C and 104°C).
 - d. They should be approved for use in foods.

9. Food employees should wash their hands after which of the following?
 - a. Taking out the trash.
 - b. Touching their face.
 - c. Handling raw food.
 - d. All of the above.
10. Cross contamination is a term used to describe the transfer of a foodborne hazard from one food to another:
 - a. by a food employee's hands.
 - b. from a cutting board.
 - c. from a knife blade.
 - d. All of the above.
11. A good way to prevent cross contamination of foods is to:
 - a. keep raw and cooked foods separate.
 - b. properly clean and sanitize food-contact surfaces.
 - c. properly wash hands.
 - d. All of the above.
12. Which of the following is an accepted personal hygiene practice?
 - a. Wearing jewelry and false fingernails.
 - b. Smoking and eating in food production areas.
 - c. Wearing caps and hats.
 - d. Wiping hands on a soiled apron.

Answers to these multiple-choice questions are available in Appendix A.

References/Suggested Readings

Centers for Disease Control and Prevention. 2006. *Surveillance for Food-borne Disease Outbreaks—United States, 1998–2002*. November 10, 2006. U.S. Department of Health and Human Services. Atlanta, GA.

Code of Federal Regulations. 2001. 21 CFR 173.315. *Secondary Direct Food Additives Permitted in Food for Human Consumption—Chemicals Used in Washing or to Assist in the Peeling of Fruits and Vegetables*. U.S. Government Printing Office. Washington, DC.

Council for Agricultural Sciences and Technology. 1995. "Prevention of Food-borne Illness. Dairy." *Food and Environmental Sanitation*. Vol. 15(6), 341–367.

Food and Drug Administration. 2009. *2009 Food Code*. U.S. Public Health Service. Washington, DC.

Food and Drug Administration. 2004. *FDA Report on the Occurrence of Foodborne Illness Risk Factors in Selected Institutional Foodservice, Restaurant, and Retail Food Store Facility Types*. U.S. Public Health Service. Washington, DC. www.cfsan.fda.gov/~dms/retrsk2.html.

Suggested Web Sites

Gateway to Government Food Safety Information
www.foodsafety.gov

United States Department of Agriculture (USDA)
www.usda.gov

Centers for Disease Control and Prevention (CDC)
www.cdc.gov

Morbidity and Mortality Weekly Report (MMWR)
www.cdc.gov/mmwr/

Food and Drug Administration (FDA)
www.fda.gov

USDA/FDA Food and Nutrition Information Center
www.nal.usda.gov/fnic

Partnership for Food Safety Education
www.fightbac.org

Food Safety Day
www.foodsci.purdue.edu/publications/foodsafetyday

Handwashing for Life Institute
www.handwashingforlife.com

Clean Hands Coalition
www.cleanhandscoalition.org

Cooper-Atkins Temperature-Measuring Devices
www.cooperinstruments.com

Raytek Corporation
www.raytek.com

Brevis Corporation
www.brevis.com

Taylor Foodservice Products
www.taylorusa.com/foodsvc/food.html

DeltaTRAK, Inc.
www.deltatrak.com