Food Safety Fundamentals

TB MED 530 / NAVMED P-5010-1 / AFMAN 48-147_IP

Tri-Service Food Code

Updated: November 2015

Purpose & Objectives

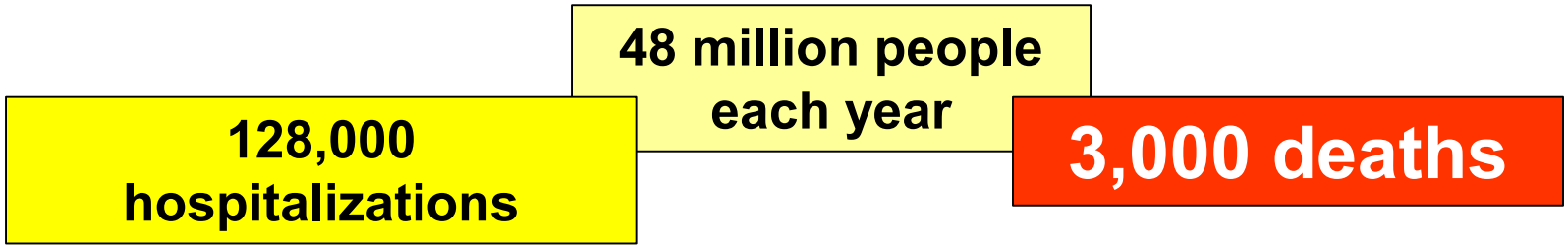
- **Purpose –** Present essential food safety and sanitation practices that must be applied in all food operations.
- **Objective –** Prevent the occurrence of foodborne illness attributed to unsanitary food operations, poor employee hygienic practices, or poor food handling practices.
- **Scope of Training –**
  - Understand the hazards to food.
  - Understand risk factors that contribute to foodborne illness.
  - Understand controls prescribed in TB MED 530 that will minimize the risk of foodborne illness.

Training Outline

- Foodborne Illness
- Food Safety Hazards
- Key Terms
- Foodborne Illness Risk Factors
- Layers of Protection
  - Personal Hygiene Practices
  - Time/Temperature Controls
  - Proper Cleaning and Sanitizing
- Quiz

Foodborne Illness

- Just because you don't hear about it often, doesn't mean it doesn't happen… *Only a small percentage of actual foodborne illness cases ever get reported—*



- Personnel who prepare and handle food play a key role in the prevention of foodborne illnesses by—
  - Adhering to prescribed food safety measures; and
  - Maintaining sanitary controls within food operations.

DFAC food employee implicated as *Salmonella* carrier—causes outbreak involving 110 Soldiers

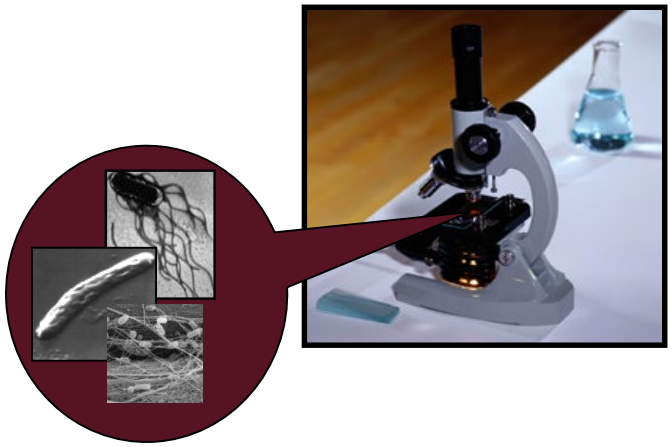
Highly susceptible populations—

- These people have a higher risk of getting a foodborne illness:
  - Elderly people
  - Preschool-age children
  - People with compromised immune systems; hospital inpatients
  - People taking certain medications
- Personnel operating in a "high stress" environment:
  - Soldiers in Basic Training
  - Soldiers engaged in field training exercises lasting longer than 2 weeks
  - Deployed personnel

Food Safety Hazards

- Harmful substances that present a food safety hazard can be **Chemical**, **Physical**, or **Biological** in nature and may result in injury or illness when ingested. *Examples include—*
  - **Chemical**: detergents, sanitizing agents, pesticides, fuel, etc…
    - Contamination of food or food contact surfaces (equipment/utensils) occurs through direct contact with chemicals or chemical residues following improper use or storage.
  - **Physical**: bone fragments, glass, toothpicks, etc…
    - When physical hazards such as insects and hair come into contact with food, biological contaminants contained on their surfaces are transferred to the food.
  - **Biological**: bacteria, viruses, parasites, yeast, & molds
    - Biological hazards contribute to almost two-thirds of all foodborne illness outbreaks.
    - Biological agents that make you sick are called “pathogens”.

The Nature of Bacteria



- Bacteria are microscopic and cannot be seen by the naked eye.
  - Hundreds or thousands of bacteria may already exist on raw foods when purchased.
- The right temperature, moisture, and food are needed for bacteria to survive and multiply.
  - Double in numbers every 15-30 minutes under ideal conditions.

The Nature of Bacteria

- Bacteria in food can cause:
  - **Infection -** *illness caused by ingesting a sufficient amount of live bacteria.*
  - **Intoxication –** *illness caused by ingesting the toxic chemical residues deposited in food when the bacteria was alive.*

Toxins—

- ✓ Poison (waste products) produced by some living bacteria.
- ✓ The longer bacteria are allowed to grow/multiply in food, the greater the amount of toxins deposited.
- ✓ Are **NOT** neutralized (destroyed) during cooking or freezing.

The Nature of Bacteria

- Some bacteria produce spores--
  - Dormant bacteria cell deposited during cellular reproduction.
  - Survival mechanism that ensures the cell will be protected when environmental conditions are adverse *(hot or cold)*.
  - Dormant bacteria cells "wake up" when environmental conditions are ideal.
  - Can survive boiling temperatures for long periods of time; **NOT** destroyed during cooking or freezing.

Bacterial Infective Pathogens

These do not produce toxins or spores—

- Salmonella
- Campylobacter jejuni
- Shigella

✓ Originate from intestinal tract of animals.
✓ Associated with fecal contamination of food during processing (slaughter).

- Listeria monocytogenes

Cool, damp environments -- floor drains & refrigerators

Toxigenic Bacterial Pathogens

Infective bacteria that also produce a toxin—

- Escherichia coli 0157:h7 (E. coli)

✓ Intestinal tract of animals & humans.
✓ Readily found in soil.

- Staphylococcus aureus

Human hair, skin, hands & throat

Toxigenic Bacterial Pathogens

Spore-forming, toxigenic bacteria—

- Clostridium perfringens

✓ Intestinal tract of animals & humans.
✓ Soil.

- Clostridium botulinum
- Bacillus cereus

Soil

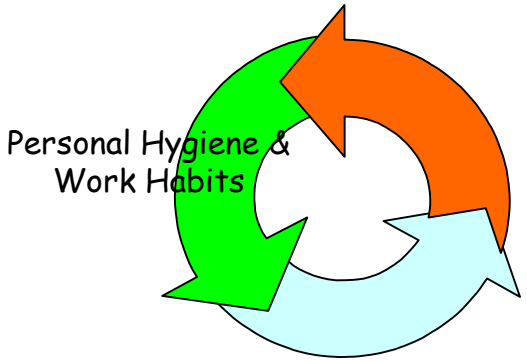
Biological Hazards *(continued)*

- Common symptoms of foodborne illness:
  - Diarrhea
  - Vomiting
  - Fever
  - Nausea
  - Abdominal cramps
  - Jaundice (yellowing of skin and eyes)
- Onset time:
  - Depend on the type of foodborne illness
  - Can range from 30 minutes to six weeks

Health Requirements *(continued)*

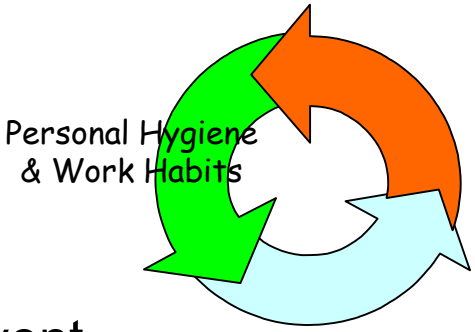
- Infected wounds and unhealed cuts or blistered burns—
  - Must be covered to prevent pathogens from contaminating food and food-contact surfaces.

- How a wound is covered depends on where it is located:
  - **Hand or wrist –** use impermeable cover (bandage or gauze covered by a finger cot) **and** then cover with a single-use glove.
  - **Arm –** use impermeable bandage.
    - If work smock has full or three-quarter sleeves, always wear the sleeves down.
  - **Body –** cover with dry, tight-fitting bandage.



Disclosure by Workers—

- Reportable symptoms:
  - vomiting
  - diarrhea
  - jaundice
  - sore throat with fever
  - infected wound or lesion with pus *(oozing boils, pimples, and sores)*



Disclosure by Workers—

- Reportable diagnosis or history of exposure
  - Reported during occurrences while holding an event

Individual Diagnosis …or	…Reportable Exposure
Norovirus	Within past 48 hours
Enterohemorrhagic (EHEC) or Shiga Toxing-Producing E. coli (STEC)	Within past 3 days
Shigella spp.	Within past 3 days
Salmonella Typhi	Within past 14 days
Hepatitis A virus	Within past 30 days

Biological Hazards(continued)

- Those handling/serving food that present with any symptoms of foodborne illnesses **MUST EXCLUDE** themselves from serving or handling foods.
  - It is the responsibility of **BOTH** the event coordinator and food handler to ensure that no food handlers/servers are sick with a foodborne illness.

- Report ALL reportable exposure to the MEDDAC- Fort Meade, Environmental Health Office at DSN: (301)677-8106

Key Terms

- A **Foodborne Illness Outbreak** is defined as 2 or more cases of a similar illness resulting from the ingestion of a common food.
  - Ice and beverages are included as a “food”.
  - The outbreak may be confirmed through laboratory analysis where the causative agent is identified.
  - Some outbreaks, such as Norovirus, are not always linked to a specific food, but can be linked to a specific facility where an infected food employee was working.

Key Terms *(continued)*

- **Contaminated –** The presence of harmful substances *(physical, chemical, or biological)* in or on food.
- **Clean –** Clean to sight and touch means there is no visible debris, encrusted food, or greasy feeling.
- **Sanitize –** Sanitizing is a process of reducing the total number of micro-organisms ("germs") on a surface to safe levels.
  - *This is **NOT** the same as "sterilization," which is a process used in hospitals to kill (remove) all micro-organisms that are on a surface.*

Key Terms *(continued)*

- **Cross-contamination –** The transfer of a harmful substance to food through direct or indirect contact—
  - Spilled chemicals or detergents on food packages or surfaces where food comes into direct contact.
  - Using unsanitized equipment or utensils to prepare, store, or serve food.

  - Bare-hand contact with foods that are ready-to-eat (RTE).
  - Bacteria from raw protein foods transferred to foods that are RTE.

Key Terms *(continued)*

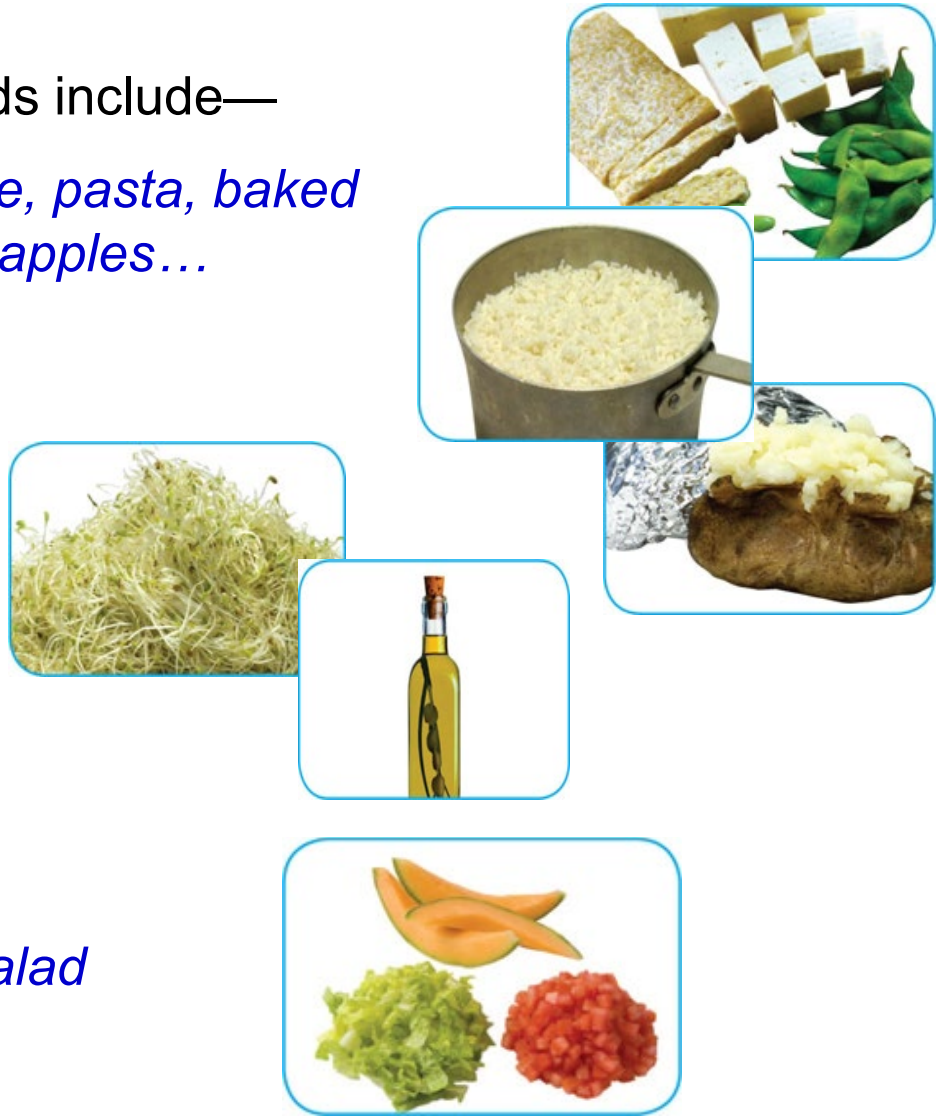
- **Time/Temperature Controlled for Safety (TCS) Food** (Previously referred to as *Potentially Hazardous Food, Time/temperature controlled for safety)* – A food that requires time or temperature control to limit the growth of harmful micro-organisms or the formation of toxins.
  - The relationship between various factors will determine if a food requires time/temperature control for safety.
    - pH of the food
    - Water activity of the food
    - Interaction between the pH and water activity
    - Heat treatment of the food
    - Packaging

Time/Temperature Control for Safety Foods

- Obvious foods include—
  - Raw or heat-treated (cooked) animal food:
    - Meat: *beef, pork, lamb*
    - Poultry
    - Seafood: *fish, shellfish, crustaceans*
    - Dairy products
    - Shell eggs*
      (except pasteurized shell eggs)

TCS Foods *(continued)*

- Other previously designated foods include—
  - Heat-treated plant food -- *rice, pasta, baked potato, fried onions, cooked apples…*
  - Raw seed sprouts
  - Cream pies
  - Gravies
  - Cut melons
  - Chopped garlic in oil
- Newly designated foods include cut plant foods (raw)—
  - Cut tomatoes
  - Cut leafy greens: *spinach, salad*



Key Terms *(continued)*

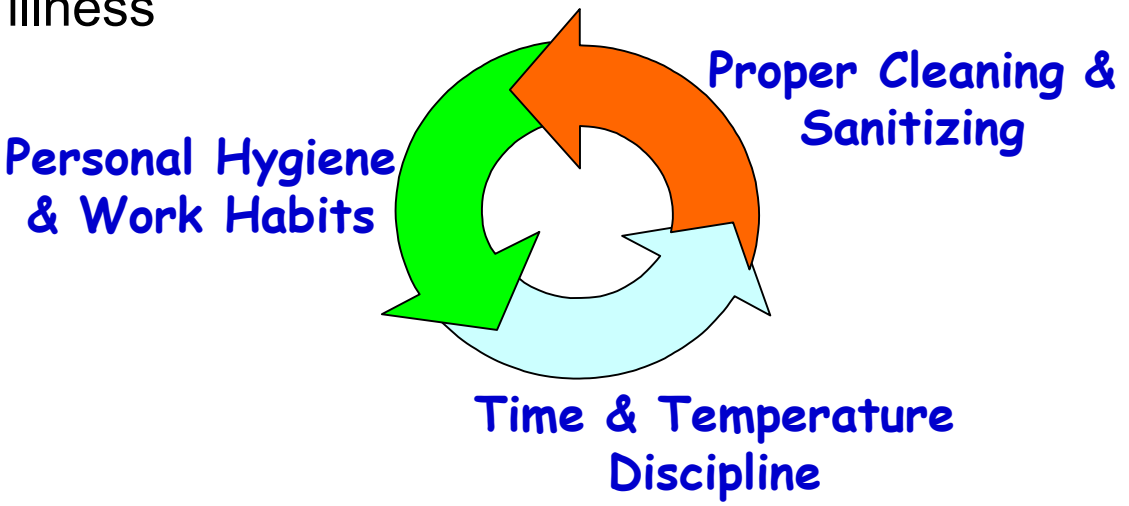
- **Ready-to-eat (RTE) Food –** A food that can be eaten without further preparation, washing, or cooking. *Examples include—*
  - Food that has already been cooked
  - Washed fruits and vegetables (whole or chopped)
  - Deli meat & cheese
  - Bakery items
  - Sugar, spices, and seasonings

Foodborne Illness Risk Factors

- There are 5 major risk factors (or conditions) related to employee behaviors and food preparation practices that contribute to foodborne illness:
  - Food from unsafe sources
  - Inadequate cooking
  - Improper holding temperatures
  - Contaminated equipment
  - Poor personal hygiene

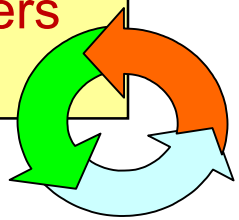
Layers of Protection

- Risk factors controlled by all food employees:
  - **#2** – inadequate cooking
  - **#3** – improper holding temperature
  - **#4** – contaminated equipment
  - **#5** – poor personal hygiene
- Applying multiple levels of control called the ***Layers of Protection*** is the underlying principle for reducing the risk of foodborne illness from biological hazards.



Personal Hygiene & Work Habits

138 ill, 51 hospitalized: *Shigella* – insulated food containers prepared in garrison DFAC served during field feeding.



- People are natural carriers of bacteria—
  - Staph bacteria found on skin & hair, regardless of how often you bathe.
  - Fecal-oral route of transmission -- *Bacteria found in our intestines transferred to everything you touch.*
- People can also carry harmful viruses that are readily transmitted through food or contact with surfaces that are touched by others.
  - Norovirus
  - Infection occurs when contaminated food is ingested or contaminated hands come into contact with mucous membranes (eyes, nose, mouth).

Personal Hygiene & Work Habits *(continued)*

- Actions that can lead to contaminated food:
  - A. Scratching the scalp
  - B. Running fingers through hair
  - C. Wiping or touching the nose
  - D. Rubbing an ear
  - E. Touching a pimple or infected wound
  - F. Wearing a dirty uniform
  - G. Coughing or sneezing into the hand
  - H. Spitting in the operation

Personal Hygiene & Work Habits *(continued)*

- People can contaminate food when—
  - They don't wash their hands after using the restroom.
  - They come to work when they are sick or have been in contact with a person who is sick.
  - They sneeze onto food or food-contact surfaces.
  - They touch dirty food-contact surfaces and equipment and then touch food.

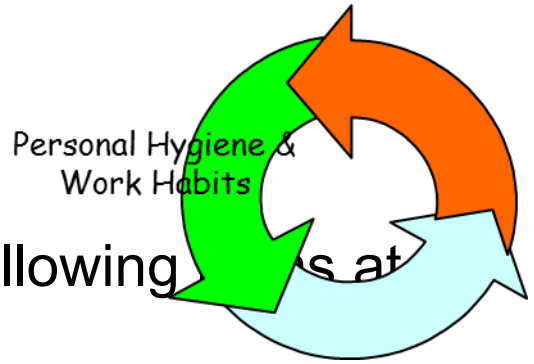
- Avoid personal behaviors that can contaminate food!

Personal Hygiene & Work Habits *(continued)*

Hand-washing "...the single most important means of preventing the spread of infection." *–Centers for Disease Control and Prevention*

- Proper and frequent hand washing and proper use of disposable gloves can reduce the risk of transmission.

Handwashing Standards



- Use only designated hand wash sinks.
- Hand wash sinks must be supplied with the following [illegible] at all times—
  - Soap;
  - Hand drying device (paper towels or approved air-knife system);
  - Trash receptacle (for paper towels).
- Food events with no access to hand washing sinks should have access to hand sanitizers and disposable gloves

Handwashing Standards

- When to wash your hands
  - Before you begin handling food
  - After using the toilet
  - Sneezing, coughing, or blowing your nose
  - Before and after handling raw meat, fish, or poultry
  - After handling garbage or dirt dishes
  - After coming back from a break, eating, smoking, or touching hair
  - Any breaks between food handling
  - Putting on chapstick

Proper Handwashing Procedure

Handwashing is a 20-second process—

1. Wet hands with hot running water

2. Apply soap

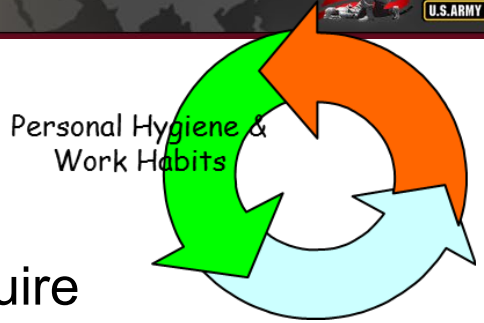
3. Rub hands together for 20 seconds

****Clean under fingernails, between fingers, and the forearms**

4. Rinse thoroughly under running water

5. Dry hands completely

Single-Use Gloves

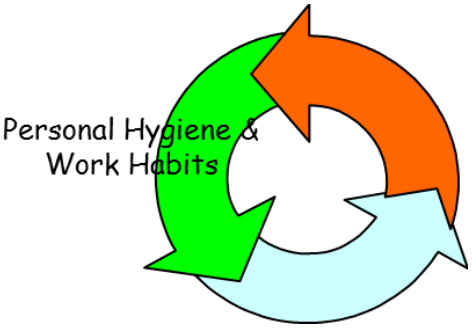


- Disposable Glove Use Policy—
  - Optional for use when preparing foods that require further cooking before being served to customers ONLY when a handwashing sink is available.
  - NEVER used in place of handwashing.
  - NEVER washed and reused.

Ready-to-Eat Foods

- Bare-hand contact with RTE foods is prohibited.
- Options include using—
  - Disposable gloves;
  - Utensil;
  - Food-grade tissue paper.

Single-Use Gloves *(continued)*



- Wearing the gloves—
  - Wash and dry hands before putting on gloves.
  - Select the correct glove size to ensure proper fit.
  - Hold gloves by the edge when putting them on.
    - NEVER blow into gloves
    - NEVER roll gloves to make them easier to put on
  - Check for rips or tears.

- When to change gloves—
  - When soiled or torn.
  - Before beginning a different task.
  - After interruptions of the immediate task.
  - After handling raw meat, seafood, or poultry and before handling ready-to-eat food.

Uniform Standards

- Clean Uniforms
  - Wear clean uniform or clothing daily;
  - Change outer clothing when it becomes heavily soiled with food debris during the course of the day.
  - Remove aprons when leaving food-preparation areas.

- Remove jewelry and watches from hands and arms when preparing, cooking, or serving food. *Exceptions allow wearing:*
  - Single, plain/smooth ring/wedding band;
  - Medical alert bracelet or necklace.

Uniform Standards *(continued)*

❑ Adequate Hair Restraints

- Clean hat or hair net.

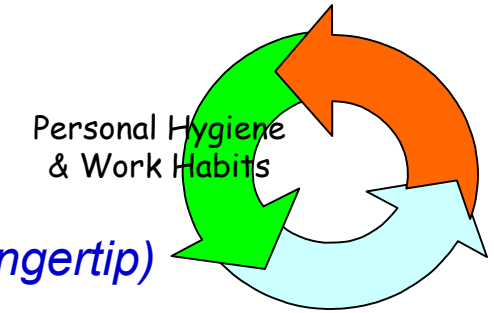
❑ Hairnets

- Beard-net (snood) and arm-net/sleeve must be worn if hair exceeds ¼-inch on face or arms.

❑ Hats

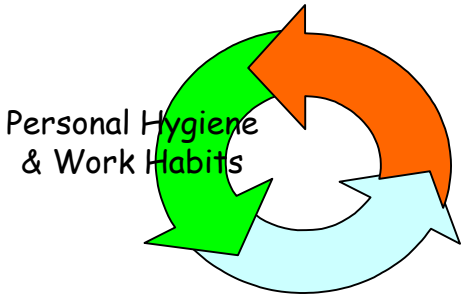
- Paper/disposable hat disposed at end of shift/day.
- Long hair must remain pinned/tied and tucked under hat or contained by hairnet.
- All males must wear a hat even if head is clean shaven – *hats prevent perspiration from dripping onto surfaces.*

Hygiene Standards



- Fingernails
  - Short *(recommend no more than ¼ inch above the fingertip)*
  - Neatly trimmed & smooth
  - No false nails, polish, or nail jewelry/ornaments
    - Wearing disposable gloves does **NOT** dismiss this requirement.

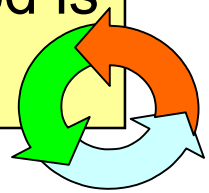
Hygiene Standards *(continued)*



- No eating, chewing gum, drinking, or tobacco use in kitchen (food prep) areas or serving lines.
  - Use only designated break areas.
  - Exception: Hydration beverage (e.g., water) in a closed container with straw.

Time & Temperature Controls

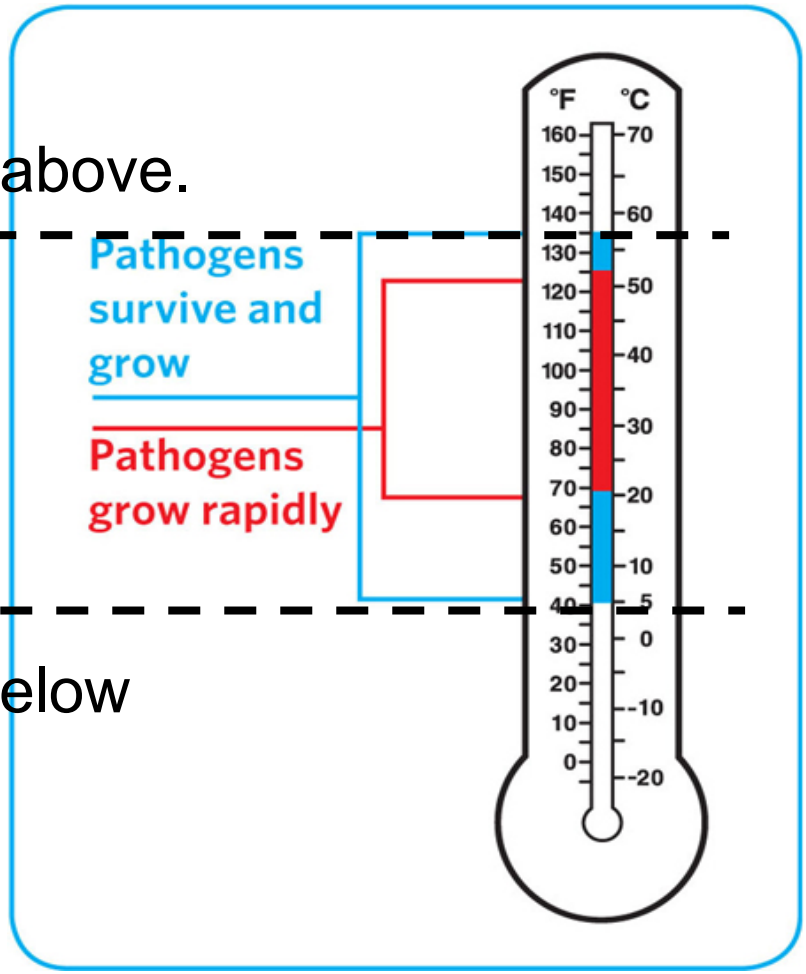
One of the critical factors in controlling bacteria in food is controlling temperature.



- Biological hazards already exist in/on food when it is purchased.
- Bacteria will grow rapidly when food is held at unsafe temperatures for more than a few hours. *For example—*
  - **Ambient Temperatures:**
    - At 90°F the number of bacteria on food will double every 30 **minutes**.
    - Over 4 billion bacterial cells can result after just 4 hours at unsafe temperatures.
    - Illness can occur after ingesting anywhere between a couple hundred to a couple thousand bacterial cells.
  - **Refrigeration Temperatures:**
    - At 26°F the number of bacteria double every 60 **hours**.

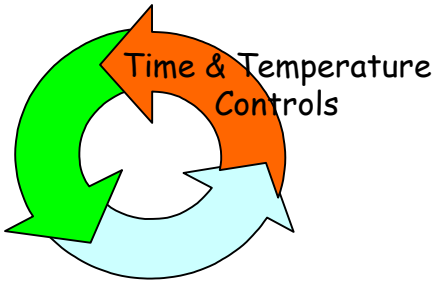
❑ Safe Temperatures—

Hot: 135°F (57°C) or above.



Cold: 41°F (5°C) or below

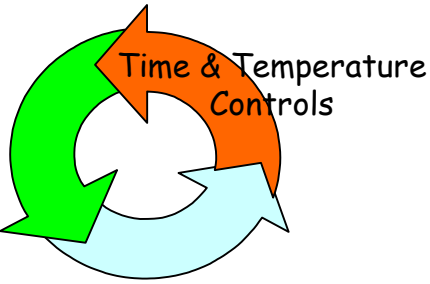
Temperature Controlled Processes



- **Receiving—**
  - Timely transfer of foods to refrigerator or freezer when receiving deliveries.
- **Cold holding—**
  - During storage & service
  - Check operating temperature of units
  - Don't over-pack units

- **Thawing—**
  - Do **NOT** thaw at room temperature!
  - Thaw in a refrigerator that maintains foods cold at 41°F or below; or
  - Thaw as part of cooking process *(frozen hamburgers on a grill).*
  - Thawing sealed & impermeable food packages under cold running water (≤70°F) is allowed, but least preferred.
    - ✓ Max time = 4 hours from when the temperature of the thawed portion reaches 41°F and includes time needed to prepare the food after thawing.

Temperature Controlled Processes *(continued)*



❑Food Preparation—

- Use small batch preparation to minimize the time food is held at unsafe temperatures during preparation.

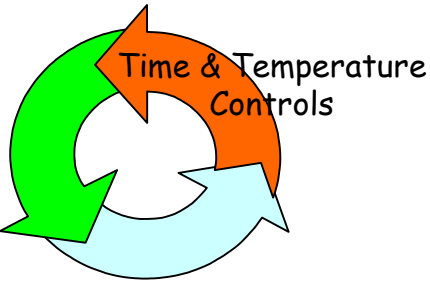
❑Cooking—

- Check internal product temperature at the terminal stage of cooking.
- Spot check multiple pieces when individual portions are arranged on a baking sheet.
- Check thickest part of product.

❑Hot holding—

- Food must be 135°F or above before being placed in hot holding.

Temperature Controlled Processes *(continued)*



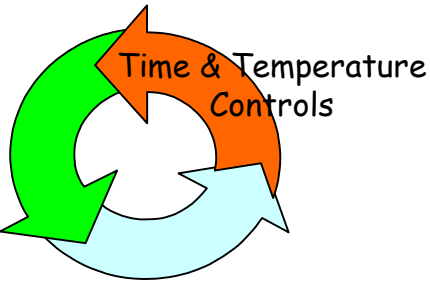
Cooling—

- Rapid cooling achieved by:
  - Slicing bulk meats
  - Transfer bulk products to multiple shallow pans
  - Immersion in ice-bath and frequent stirring
  - Loosely cover food containers before storing.

Cooling Criteria:

- Hot foods cooled to 70°F or below within 2 hours, and then to 41°F or below within 4 hours *[6 hours for total process]*.
- TCS foods prepared from ambient ingredients—
  - Cooled within 4 hours to 41°F or below.

Thermometer Calibration

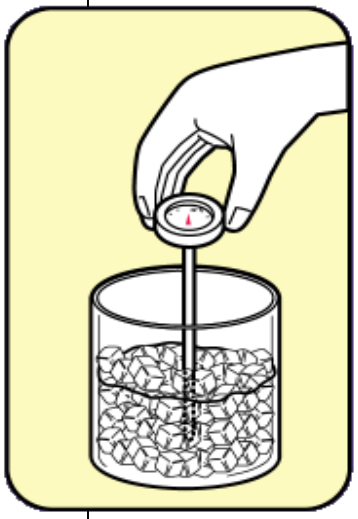


- **Boiling Point Method**
  - Thermometers used for hot holding or cooking.
- **Ice Point Method**
  - Thermometers used for cold holding.

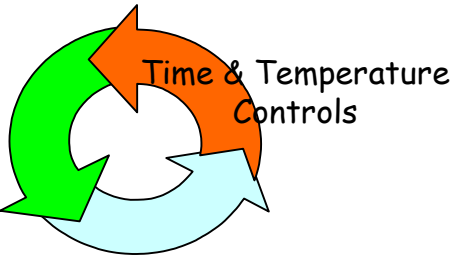
❖Calibrating at cold temperature may not result in calibration at the hot end of the thermometer scale.

Ice Point Calibration Method

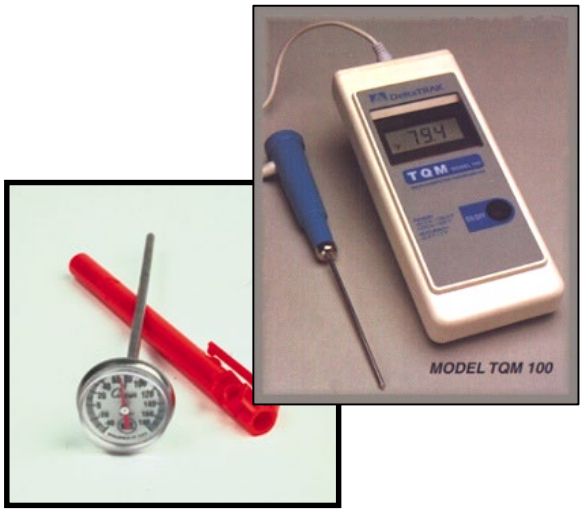
- ❑Fill cup with ice;
- ❑Add cold water to cover ice;
- ❑Immerse thermometer probe;
- ❑Wait 5 minutes to allow temperature to stabilize;
- ❑Thermometer should indicate 32°F—
  - Follow manufacturer's instruction to adjust calibration.
  - For bi-metallic stem-type, adjust by turning the nut located under the dial.
  - Calibration is achieved when scale indicates temperature within ± 2°F (± 1°C) of desired measurement.



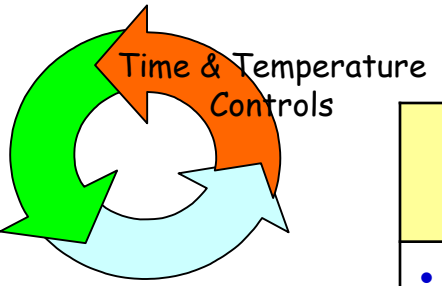
Thermometer Requirements



- Thermometers must be readily available for spot checking internal food temperatures.
  - Verify food in hot & cold holding.
  - Verify terminal cooking temperature was achieved.
  - Calibrate daily to ensure accuracy.
  - Sanitize between foods & prior to each use.



Temperature Control



Food Type *(Refer to TB MED 530 for complete listing)*	Temp
• Poultry & poultry products • Stuffed meats & vegetables containing meat • Leftovers & dishes containing leftover ingredients • Microwaved foods	**165°F**
• Sausage • Ground meats • Fish • Cured, injected, or mechanically tenderized meats • Bulk-prepared scrambled eggs	**155°F**
• Whole muscle meats (lamb, beef, veal, pork) • Made-to-order eggs	**145°F**
• Cooked plant food that do not contain meat, poultry, fish, or eggs	**135°F**

Temperature Control

❑HOT HOLDING

- ❑Maintain food at 135 °F or above
  - Food must be reheated prior to placing in hot holding
  - take internal product temperature

HOT HOLDING

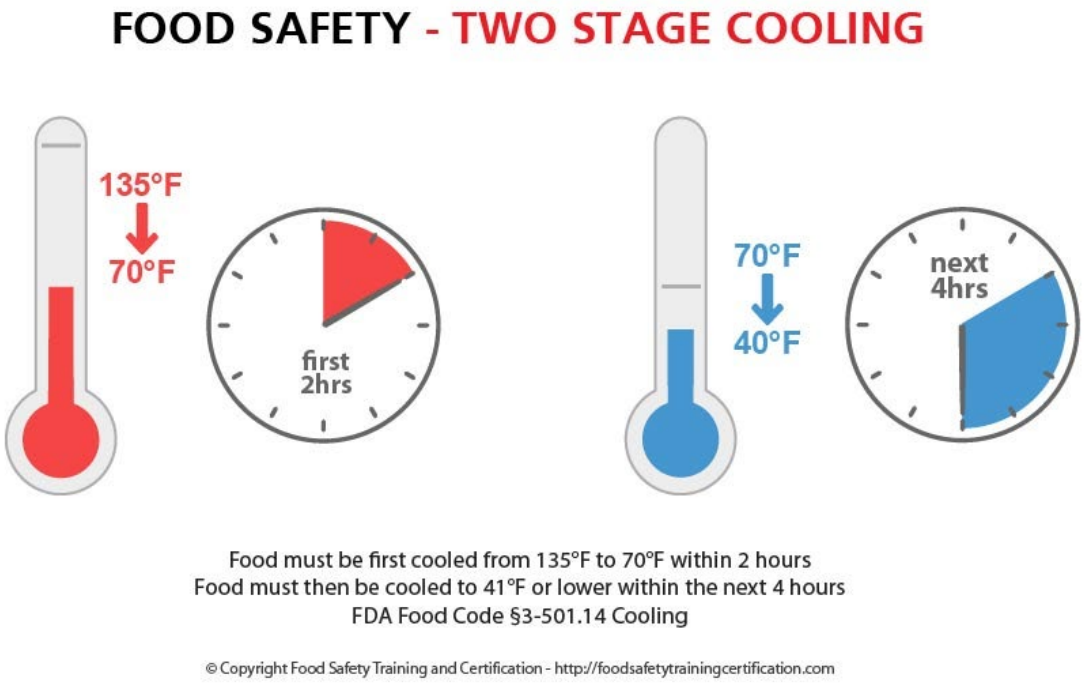
- Disposable chafing dishes
  - (Used when electricity is not available)
  - Place water in pan prior to adding food pans
  - Allow time to warm up prior to placing food

Temperature Control

- COOLING
  - Ice Bath (Food should have no contact with ice)
  - Reducing Quantity (Smaller Batches)

❑ COOLING

- Cooked TCS food must be cooled within a total of 6 HOURS
  - Within 2 HOURS from 135°F to 70°F AND
  - Within 4 HOURS from 70°F to 41°F



Time Without Temperature Control *(continued)*

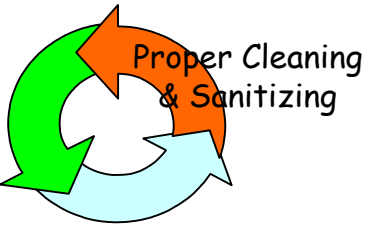
4-hour rule: Hot & cold foods –

- Food held at 41ºF (5ºC) or less, or at 135ºF (57ºC) or higher before removing from temperature control.
- Label indicates date & time removed from temperature control.
- Label indicates the time that is 4 hour past the point when removed from temperature control. *Food must be sold/consumed or discarded by this time.*

6-hour rule: Cold foods only—

- Food starting temp is 41ºF (5ºC) or less before initiating Time control process.
- Food temperature does not exceed 70ºF (21ºC) at any time.
- Labeling requirements same as 4-hour rule.
- Sell, consume, or discard when food temp reaches 70ºF or 6-hour point, whichever comes first.

Cleaning & Sanitizing

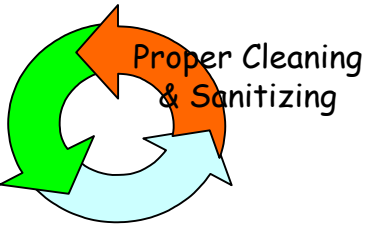


- Proper cleaning and sanitizing is the third layer of protection to ensure food safety.

Unsanitized food utensils in DFAC resulted in 169 service members getting sick; 75 hospitalized

- **Task:** Cleaning and sanitizing food contact surfaces—
  - Manual and mechanical pot/pan, equipment, & utensil washing
  - Clean-in-place food equipment & food prep tables
  - Dining room tables & condiment containers
  - Beverage dispensers & serving lines

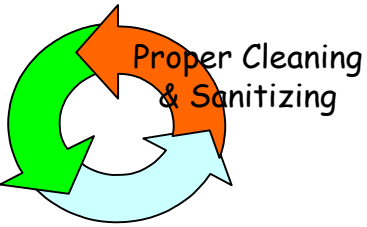
Methods for Sanitizing



- **Chemical Sanitizers: *chlorine (bleach), quaternary ammonia,* or *iodine*—**
  - Food prep tables, dining room tables, food/beverage dispensers, & condiment containers
  - Used when hot water sanitizing cannot be achieved during mechanical or manual warewashing.
  - Requires longer time for treated surfaces to air dry.

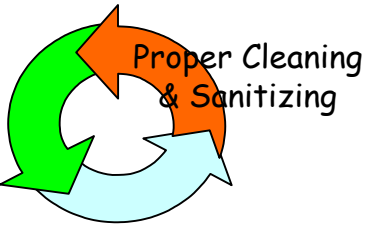
Chemical Sanitizing				
Sanitizer Concentration	**Chlorine**		**Quats**	**Iodine**
	100 mg/L	50 mg/L	*varies** (≤ 200 ppm)	12.5 – 25* mg/L
Contact Time	15 sec	7 sec	30 sec	30 sec
Water Temp	55°F (13°C)	pH ≤10, 100°F (38°C), **or** pH ≤8, 75°F (24°C)	75°F (24°C)	68°F (20°C)
Water pH	8 or 10		n/a	≤ 5.0*
* *Solution concentration prepared per manufacturers' instruction; pH for iodine must not exceed manufacturer's specification.*				

When Chemical Sanitizers are Used…



- Prepare fresh solution daily and as often as necessary to maintain proper concentration.
  - Concentration will dissipate over time, by heat *(hot water)*, contamination *(food debris),* & soapy water.
- Prepare according to manufacturer's instruction.
- Do **NOT** mix different chemical agents in the same solution.

Chemical Sanitizers *(continued)*



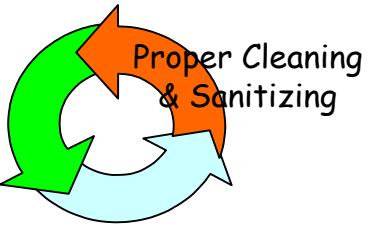
- Use chemical test kit or test paper to verify concentration of the prepared solution—
  - Conducted each time a solution is prepared!
  - Minimum required concentration achieved.
  - Maximum concentration **NOT** exceeded.
  - Spot check throughout the day or period of use.
- Second clear water rinse required when sanitizer concentrations are exceeded—
  - Chlorine > 200 mg/L
  - Quats > 200 mg/L
  - Iodine > 25 mg/L

Preparing Bleach Solutions

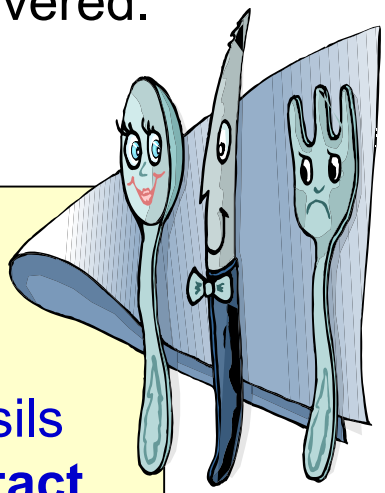
- Use only plain, liquid-type, household bleach.
  - Scented & gel products prohibited!
  - Industrial-strength products prohibited!
  - Check product's base concentration *(5.25 - 6% or 8.25% strength)* to ensure proper mixing formula is used.

Preparation Type	Chlorine Product Base Strength	
	5.25% to 6%	**8.25%**
Bulk (sink)	2 Tablespoons (30 ml) per 4 gallons (15.2 L) water	4 teaspoons (20 ml) per 4 gallons (15.2 L) water
Spray Bottle	½ Tablespoon (7 ml) per 1 gallon (3.8 L) water	1 teaspoon (5 ml) per 1 gallon (3.8 L) water

Preventing Contamination



- Protect cleaned & sanitized items from contamination between uses—
  - Store away from chemicals, soiled linens, & soiled dinnerware or equipment.
  - Keep storage & drying racks/shelves clean.
  - Store plates, cups, & bowls inverted or covered.
  - Store silverware with handles facing up.



Hygienic Practices:

- ✓ Wash hands before handling clean/sanitized items.
- ✓ Handle cups, glasses, bowls, plates, silverware, & utensils **without touching inside surfaces or surfaces that contact food or the user's mouth.**