

| CRITICAL PATHOGEN TEMPERATURES |       |  |
|--------------------------------|-------|--|
| TEMPERATURE                    |       |  |
| °F                             | °C    |  |
| 250                            | 121.1 | - Food sterilization (10 <sup>12</sup> <i>C. botulinum</i> spores inactivated in 3 minutes)                |
| 212                            | 100   | - Some toxins persist for hours  |
| 160                            | 71    | - Rapid <i>Salmonella</i> death rate, 100,000 to 1 in 5.2 seconds  |
| 150                            | 66    | - Moderate <i>Salmonella</i> death rate, 100,000 to 1 in 52 seconds  |
| 140                            | 60    | - Slow <i>Salmonella</i> death rate, 100,000 to 1 in 8.7 minutes   |
| 130                            | 54    | - Very slow <i>Salmonella</i> death rate, 100,000 to 1 in 87 minutes                                       |
| 125                            | 51.7  | - <i>C. perfringens</i> stops multiplying  |
| 122                            | 50    | - <i>S. aureus</i> and <i>B. cereus</i> stop multiplying   |
| 115                            | 46    | - Most infective microorganisms stop multiplying   |
| 105.8                          | 41    | - <i>C. perfringens</i> multiplies rapidly (1 generation = 7.1 minutes)                                    |
| 97                             | 36    | - Rapid multiplication of most vegetative cells (1 generation = 20 to 30 minutes)                          |
| 53.6                           | 12    | - <i>C. perfringens</i> begins to multiply   |
| 50                             | 10    | - <i>S. aureus</i> begins to produce toxin; <i>C. botulinum</i> (types A and B) begin to multiply          |
| 43                             | 6     | - <i>S. aureus</i> begins to multiply  |
| 41                             | 5     | - Some <i>Salmonella</i> begin to multiply   |
| 38                             | 3     | - <i>E. coli</i> and <i>C. botulinum</i> (type E) begin to multiply ( <i>B. cereus</i> at 39.2°F)          |
| 30                             | -1    | - <i>L. monocytogenes</i> , <i>Y. enterocolitica</i> , and <i>A. hydrophila</i> begin to multiply (29.3°F) |
| 28.5                           | -2    | - Meat, fish, and poultry begin to thaw  |
| 23                             | -5    | - Spoilage bacteria begin to multiply  |

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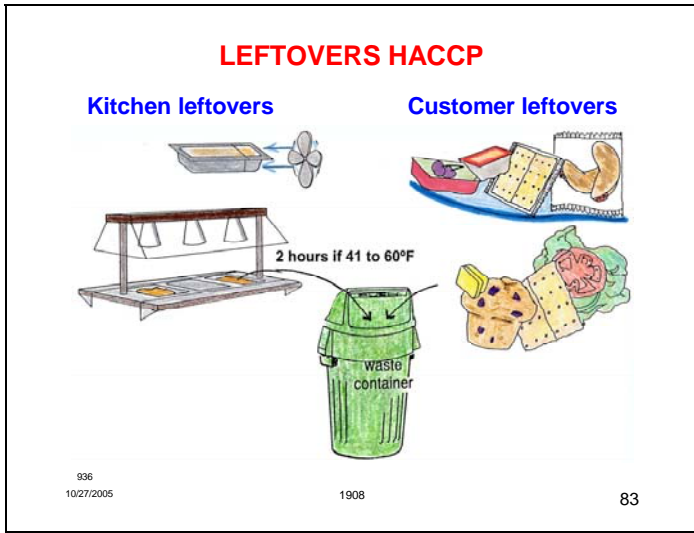
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### Critical Temperatures

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

- 23°F** Spoilage bacteria begin to multiply. Enzymatic activity causes deterioration of frozen food, even down to **-40°F**.
- 28.5°F** Meat, fish, and poultry begin to thaw.
- 30°F** *Yersinia* spp., *Listeria monocytogenes*, and *Aeromonas hydrophila* begin to multiply (**29.3°F**).
- 38°F** *Escherichia coli* and *Clostridium botulinum* (type E) begin to multiply. *Bacillus cereus* begins to multiply at **39.2°F**.
- 41°F** Some *Salmonella* spp. begin to multiply. Food must not be held for more than 7 days, or more than 10 multiplications of pathogens.
- 43°F** *Staphylococcus aureus* begins to multiply, but it does not produce a toxin until the temperature of the food goes above **50°F**. The temperature range of 40°F to 50°F allows food to be out of the refrigerator for a short period of time during preparation in a kitchen. Thirty minutes is probably a reasonable time limit for preparing food before it is cooked or returned to the refrigerator. Food should always be returned to the refrigerator at less than **50°F** unless it is cooked immediately.
- 50°F** *Staphylococcus aureus* begins to produce toxin. *Clostridium botulinum* (types A and B) begin to multiply.
- 53.6°F** *Clostridium perfringens* begins to multiply.
- 95-97°F** The temperature of rapid multiplication for most pathogenic bacteria.
- 105.8°F** *Clostridium perfringens* can multiply once every 7.1 minutes in ground beef.
- 115°F** Most vegetative cells stop multiplying.

- 122°F** *Staphylococcus aureus* and *B. cereus* stop growing.
- 125°F** *Clostridium perfringens* stops multiplying. This is the highest growth temperature for a pathogen.
- 130°F** Vegetative infective pathogens such as *Salmonella* spp. can be reduced from 3,160,000 microorganisms per gram of food to less than 1 per gram (6.5 D) in 112 minutes. This is the lowest temperature and time to which food should ever be cooked.
- 140°F** Destruction of *Salmonella* spp. is 10 times faster than at 130°F. At 140°F, 3,160,000 *Salmonella* spp. per gram of food is reduced to 1 per gram (6.5 D) in 11.2 minutes.
- 150°F** At this temperature, a population of 3,160,000 *Salmonella* spp. per gram of food is reduced to 1 per gram (6.5 D) in 1.12 minutes (67 seconds).
- 160°F** Rapid destruction of pathogenic vegetative infective microorganisms such as *Salmonella* spp. occurs. 3,160,000 *Salmonella* spp. per gram of food are reduced to 1 per gram (6.5 D) in 0.112 minute (6.7 seconds). Some spoilage microorganisms survive heat at this temperature. These vegetative cells remain in the food and cause it to spoil during refrigerator storage.
- 212°F** All vegetative cells are destroyed, but spores survive. Toxins that may have been formed during the growth phase of *S. aureus* and *B. cereus* will remain unchanged and toxic for hours at this temperature.
- 250°F** This is the temperature for sterilization of food. Spores of *C. botulinum* at a concentration of 10<sup>12</sup> per ml in the center of a can of food are reduced to 1 in 3 minutes during the commercial canning of food.



936

### Leftovers HACCP

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

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

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

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

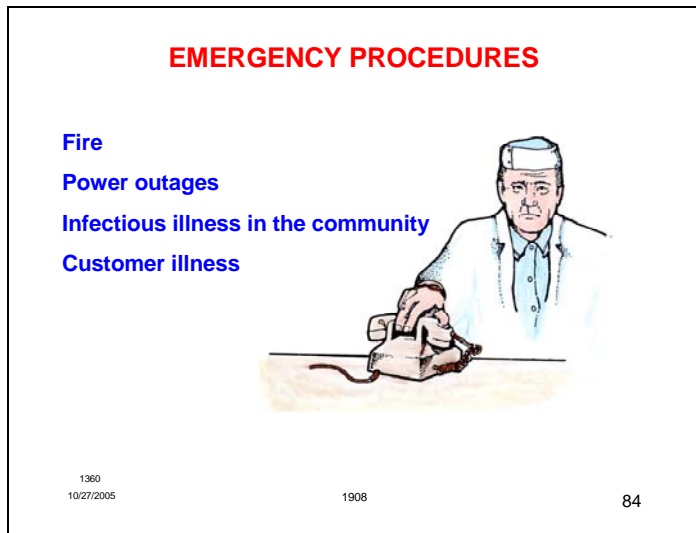
Leftovers should never be combined with fresh product. This practice causes the fresh product to spoil much faster because of the contaminating microorganisms from the old product. Any food to be reheated must be inspected. **If there is any doubt about the safety of the food, throw it out!** If the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

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

### Customer Leftovers

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

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



1360

but also for all preparation and cooking, ice making, and preparing of carbonated and other hot and cold beverages.

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

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

## Emergency Procedures

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

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

### Sample Procedures

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

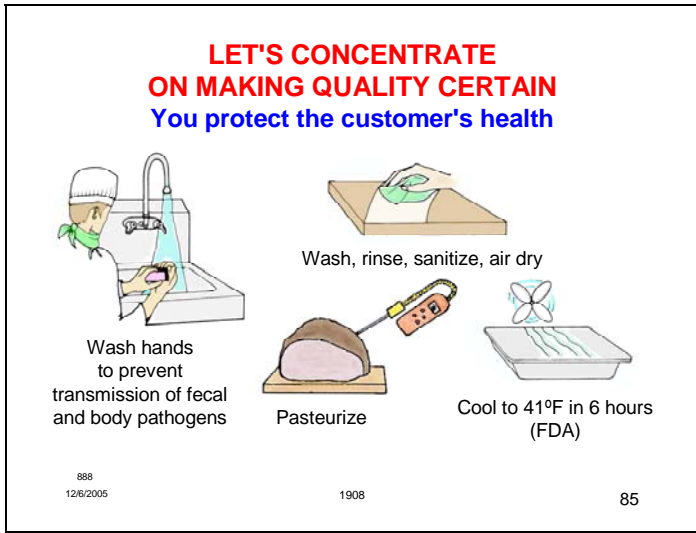
**Choking.** *If any individual is choking, assist the person by using the Heimlich Maneuver. (A poster should be displayed on the bulletin board.)*

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

### FDA Regulations

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

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



888

### HACCP Summary

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

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

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

**FOOD PASTEURIZATION TABLE**

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

- Heat food from 41 to 130°F in less than 6 hours (scientific research).
- Keep hot foods at 130°F (safety); 135°F (FDA Food Code compliance); 150°F (quality).
- Cool hot food from 135 to 70°F in 2 hours, followed by further cooling to 41°F, for a total time of 6 hours or less (FDA Food Code), or cool from 120 to 55°F, followed by

continued cooling to 40°F (no time limit) (USDA Guidelines).

- To cool food rapidly, use shallow pan(s) with food depth of <2 inches or food in ≤1-gallon containers.
- Keep potentially hazardous cold food at 41°F or colder no longer than 7 days (FDA Food Code).
- Minimize or eliminate leftovers.
- Do not add fresh food to old food.

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

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

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

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