

RETAIL FOOD PROCESS CONTROLS THAT ASSURE HAZARDS ARE AT A TOLERABLE LEVEL

To validate refrigerated processes, use non-pathogenic *Listeria innocua* and control for <10 generations. To validate pasteurization and washing surfaces, use non-pathogenic *E. coli* ATCC 25922.

INPUT

- (HC) Employee fingertip washing and drying for a 10^{-6} reduction, or <1 highly infective *E. coli* per ml finger rinse water.
- (HC) Water, supplier HACCP; the hazards are at safe levels.
- (QC) Insects, rodents, and birds excluded through construction.

PROCESS

Receiving

- (HC) Food to be eaten as received; must have supplier HACCP safety certification*.
- (QC) Just-in-time delivery acceptance <10°F or <45°F.
- (HC) Avoid biological, chemical, and physical contamination at receiving.
- (HC) Damaged packages, cans, and infested packages stored separately for return to supplier.

Storage

- (QC) Label food containers with receiving date.
- (QC) Short-term frozen storage <10°F; long-term 0 to -20°F.
- (HC) Aerobic, refrigerated, raw food spoils safe or is made safe by washing or pasteurization.
- (HC) Refrigerated, ready-to-eat food is used before there is time and temperature for 10 generations of *Listeria innocua* to multiply.

Pre-preparation

- (QC) Use oldest ingredients first.
- (HC) Thawing can be conducted at room temperature in an airflow of <50 feet / minute. It is critical to melt all ice in the center of the food before cooking or cook from the frozen.
- (HC) $>10^3$ spoilage bacteria / gram initial counts inhibits *Staphylococcus aureus*, *Clostridium botulinum*, toxin production
- (HC) Food contact surfaces for ready-to-eat food cleaned for 10^{-5} reduction.
- (QC) Cut - chop 24 hours before use to moderate multiplication.
- (QC) Keep food temperature <40°F, except during preparation, <55°F. Chill raw food <4 inches deep.
- (HC) Double wash fruits and vegetables in cold water, 10^{-2} reduction or use thermal pasteurization of surface, 10^{-5} reduction.
- (HC) Keep raw, unprocessed and ready-to-eat foods separate.

Preparation

- (HC) Ferment with controlled starter culture or validated HACCP procedures.
- (HC) Use additives according to CFR.

Acid control:

- (HC) Control salmonellae in unpasteurized food with pH <4.1.
- (HC) Control *Clostridium botulinum* in pasteurized food with pH <4.6.
- (HC) Salt control *Staphylococcus aureus* toxin production, 12% in water phase or temperature control <50°F or >115°F.
- (HC) Heat 50 to >130°F, <6 hours to control *Clostridium perfringens*; <15 hours to control *S. aureus* toxin.
- (HC) Pasteurize raw, wet meat, fish, and poultry: 7D salmonellae, z = 10°F; D₁₄₀ = 1.73 minutes to achieve <1 *Salmonella* per 100 grams.
- (HC) Sterilize: 12D *C. botulinum*, z = 18°F; D₂₁₀ = 400 minutes.
- (HC) Hold surface and center >130°F with controlled Rh >90%
- (HC) Cool center 130 to 45°F with 38°F driving force, <15 hours.
- (HC) Mix cold salads with <50°F ingredients.
- (HC) Do not add any ingredients that are not on the label / recipe.

OUTPUT

Package -- transport -- serve

- (HC) Temperature >130°F, or pasteurized food <38°F, or at any time-temperature that limits vegetative forms of spore pathogens to multiply to <10 generations between production and consumption.
- (QC) To retain nutrients, hot hold 150°F, <30 minutes.
- (HC) Hot food serves <170°F to avoid burns to the mouth and skin.
- (HC) Avoid contamination of cold, ready-to-eat food with hazards.
- (HC) Package for the consumer <2 inches thick. Label, "Consume in 2 hours, or begin cooling in less than 2 hours. Do not cool food in a container in a bag. Remove the bag. Cool center to 45°F in less than 15 hours."
- (HC) Label allergic ingredients. Answer consumer allergy questions about food ingredients.

Leftovers

- (HC) Do not add fresh food to old food (allergen control); (QC) spoilage control.
- (QC) Note: Reheating is not used as a hazard control, because it will not control toxins, poisons, and physical hazards.

* Hazard certification: that hazards are at a tolerable level. Without hazard certification, assume:

- Salmonella* spp.: <10 / gram
- Listeria monocytogenes*: <10 / gram
- Staphylococcus aureus*: <100 / gram
- Clostridium perfringens*: <100 / gram
- Bacillus cereus*: <100 / gram
- Clostridium botulinum*: <1 / gram
- Chemical: safe level
- Physical: <1/16 inch