

Guidance for Processing  
**CURED & SMOKED HAM & PORK LOINS**  
*in Retail Operations*

AFDO, May 21, 2004

## Credits

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## Background

This guidance has been prepared in response to a notable increase in on-site retail processing (manufacturing) of foods traditionally processed in controlled plant environments. Such retail processing can involve, but is not limited to acidifying, smoking, drying, fermenting, curing, reduced oxygen packaging, and other operations that are traditionally done at a food manufacturing plant level. The key distinction for processing as related to this guidance is that the processing occurs on-site in the retail setting.

This guidance is intended for retailers and regulatory personnel to help understand the controls to implement in a retail operation in order to process and sell safe food products. It can be referenced in developing considerations for **variances** for any exception or special provision to state or local food safety or sanitary codes. It addresses those special variances required by the FDA Food Code which may require HACCP plans for those jurisdictions that have adopted those portions of the FDA Food Code. In addition, it also applies to regulatory oversight and/or approval for regulatory overlap that may occur between the states' processing requirements and the state or local retail food safety and sanitary codes. This guidance assumes retail compliance with applicable retail food codes, prerequisite standard sanitary operations procedures, and labeling requirements specified in 21 CFR 101. This guidance is not intended to replace or duplicate existing regulations, but it does offer a reference for more uniform practices.

## Disclaimer

This guidance is not a binding set of requirements. The information provided in the guidance are recommendations based on current science, commercial experience and practical considerations as assembled by the assigned committees and reviewed by a variety of selected experts and the Project Steering Committee. Use of these recommendations would likely result in retail processing practices that are acceptable to the pertinent authorities for food safety. Retail compliance and enforcement will remain within the interpretations and decisions of the pertinent state and local regulatory authorities.

## Product Description

This recommended guidance is for specialty meat products processed at retail, for display and distribution at retail.

### Related Terminology:

**Approved source** - a source that has been determined to conform to principles, practices, and standards that protect public health.

**Cold Smoking** - a smoking process conducted to add color and flavor to pre-cooked products.

**Cure Accelerator** - compounds such as ascorbic acid or erythorbic acid or their derivatives, sodium ascorbate and sodium erythorbate as defined for use in 9 CFR 424.21 which shortens the time required for the distinctive pink color to develop in cured meat and poultry products.

**Curing** - the development of a characteristic pink color in meat based on the interaction of nitrite and meat pigments, or other physical processing.

**Identifiable source** - can include the name and address of the immediate supplier and the actual source or location of the supplies.

**Injection** - the process of transferring a curing solution into whole muscle meat using a needle or group of needles connected to a brine source.

**Potentially hazardous food (PHF)** - means a food that is natural or synthetic and that requires temperature control because it is in a form capable of supporting the rapid and progressive growth of infectious or toxigenic microorganisms or the growth and toxin production of *Clostridium botulinum*. Potentially hazardous food includes an animal food that is raw or heat-treated, shell eggs, or a food of plant origin that is heat-treated or consists of raw seed sprouts, cut melons, and garlic-in-oil mixtures that are not modified in a way that results in mixtures that do not support growth as specified in this definition.

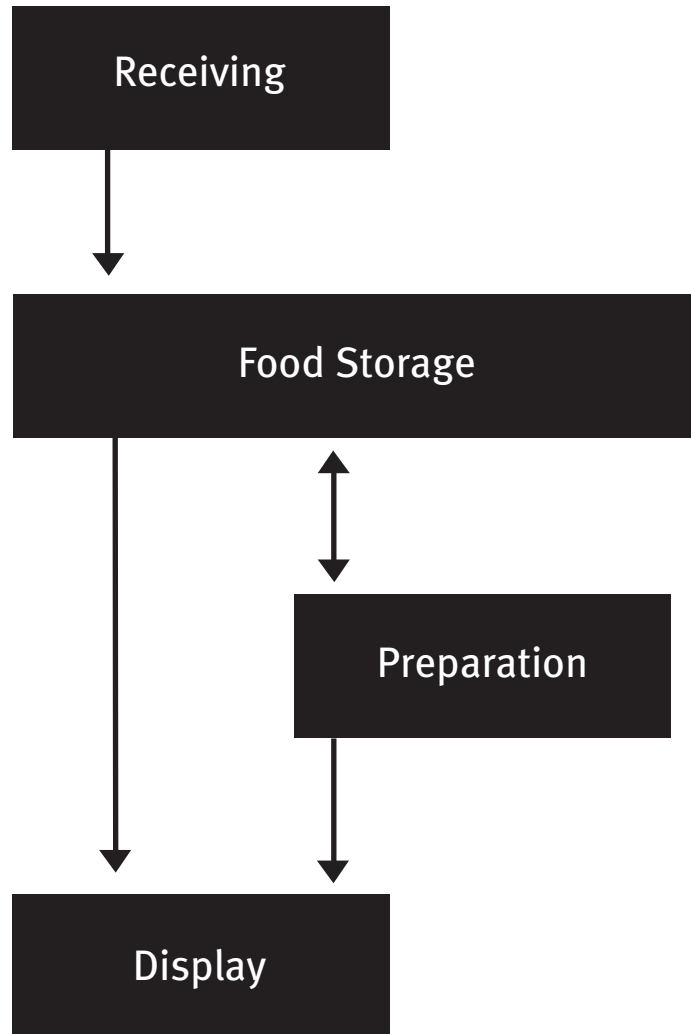
**Showering (chilling)** - a potable water spray with or without liquid smoke in the smoke house which, depending on when the water spray is applied, promotes rapid cooling or reduces casing shrinkage.

**Smoked Meat** - fresh, dried or cured meat that is subjected to smoke from hardwood fires or application of liquid smoke.

**Smokehouse** - a piece of equipment or room sized enclosure used to conduct the smoking and cooking process which has a smoke source, adequate ventilation, heat and humidity source if necessary, approved plumbing and waste lines if necessary, support structures for the food products to be smoked and a method to determine internal product temperature.

**Trichina treatment** - one of the prescribed methods in 9 CFR 318.10 to render food products, i.e., pork and game meat products, free of the *Trichinella spiralis* parasite.

# Flow Diagram of Operations



# Check List for Operations

## Receiving

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**All meats, including game animals, come from an identifiable, approved source. All food is properly packaged and labeled, and complies with all specifications.**

**All PHF are delivered at or below 41°F (5°C) or solidly frozen.** A calibrated thermometer is used to monitor the internal and/or surface temperature of the incoming foods before acceptance (Appendix 2 - Calibrations).

**Retail establishment actively manages a program for routine inspection of incoming products for approved sources, product condition and temperature as necessary, integrity of packaging and proper label information, and documents product acceptance or rejection with dates, times and the person in decision, plus any necessary comments.**

## Food Storage

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Food storage should be in appropriate temperature control units (walk-in coolers, refrigerators or freezers) capable of maintaining proper product temperatures. All potentially hazardous foods (PHF) should be maintained at 41°F (5°C) or less and it is recommended that frozen items be stored at 0°F (-18°C) or less. The foods may include raw ingredients or finished products. These types of foods may be stored in separate units or segregated with adequate protection to prevent cross-contamination within the same unit. Display counters are not considered storage units and should not be used to store raw ingredients or finished products prior to actual display. The storage temperatures should be monitored as part of the daily SOP's (Appendix 4 - Daily SOP Check List).

**The storage unit(s) are clean and orderly.**

Products are contained and/or covered for protection.

Containers of products or ingredients that are removed from the original (identified) packages are relabeled, marked for identification and dated.

Ready-to-eat items and items ready-for-display are segregated from products that require further handling or processing.

Products are not stacked without adequate support and means to prevent any leakage between products.

Dripping is prevented in or on packaged products due to condensation, cooler pan leaks or other wet sources.

Products are stored above the floor (approx. 6 inches) and away from walls and the ceiling.

The schedule for product rotation should use a 'First-in First-out' (FIFO) rule.

**Display units are not considered storage units and should not be used to store raw ingredients. Display units must be maintained at or below 41°F (5°C).**

**Frozen storage unit(s) have the capacity and are operating correctly to assure the frozen foods are maintained solidly frozen, preferably at /or below 0°F (-18°C).**

**Routine monitoring for proper refrigerated storage unit temperatures involves use of a continuous time-temperature recording device or by periodic checks with a thermometer.** All recorders and thermometers are calibrated periodically or as needed (Appendix 2 - Calibrations). When storage conditions above 41°F (5°C) are detected, an evaluation is conducted of all products stored in the unit. The evaluations will document considerations for the actual temperature of the products and duration of exposure. All temperature abused, off-color, off-odor, off-condition, out-of-date or otherwise suspect product is discarded.

Frozen products are thawed in refrigeration at or below 41°F / 5°C in a manner to prevent cross-contamination with other refrigerated foods. If more rapid thawing is necessary, the products are placed in clean flowing water no warmer than 70°F (21°C) only until thawing is complete. Do not allow products to thaw beyond 41°F (5°C) continuing processing or return to proper refrigeration. Packaging is recommended to protect the product from direct contact with the thaw water. If thawing requires direct water contact with the food, the procedure should be conducted in a sanitized sink or container that is designated or dedicated to this operation. Thawing is not conducted in water warmer than 70°F or at room temperature.

## Preparation

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**Standard Operating Procedures (SOP's)** for basic sanitation and food safety are used and documented daily (Appendix 4 - Daily SOP Check List). The daily check list should focus attention to assure:

Work area is maintained in an orderly manner, consisting of clean and sanitized countertops and sinks, clean floor and drains, and convenient and properly supplied handwash sinks.

All chemicals are properly stored and labeled.

All utensils, equipment, cutting boards, cooking or heating equipment are properly cleaned and sanitized.

Thermometers and recorders are calibrated and operating properly.

## Processing Steps

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There are numerous processing steps required to produce specialty meats and the variety and details for these steps can vary depending on the particular products. Explanation for the various processing steps in terms of necessary HACCP considerations have been compiled in an AFDO training manual, “Meat and Poultry Processing at Retail” and an accompanying guide, “Retail Meat and Poultry Processing Guidelines” (<http://www.afdo.org>). Additional references can be obtained through the USDA website (<http://www.fsis.usda.gov>) or the FDA Food Code and Annexes (<https://www.law.cornell.edu/cfr/text/9/424.21>).

This guide features the primary processing step for the following products:

**Cured & Smoked Ham, and Pork Loins**

**Smoking/Cooking**

**Chilling**

## Preparation – Curing

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Various curing processes have been developed to prevent *Clostridium botulinum* growth and toxin formation and partially preserve the meat and provide flavors and colors that appeal to consumers. These processes can include salt curing, dry salting, pickle curing, sweet pickle curing and /or smoking. Each method can use a particular curing agent (salt, nitrate/nitrite, sweetener, and/or antioxidants) which can be applied by immersion, injection, pumping, dry salting or direct additions. The particular agents and methods for application must be used in accordance with established regulations for food safety.

**Use of curing agents, curing accelerators and other additives shall be according to 9 CFR 424.21 “Use of Food Ingredients and Sources of Radiation” which can be viewed at <https://www.law.cornell.edu/cfr/text/9/424.21>.**

The formulation and preparation procedure must be documented for each lot or batch of product processed.

Only pre-measured / pre-weighed packages of curing compound should be used.

The curing process using immersion and injection should be done so that the product temperature remains at or below 41°F (5°C).

## Preparation – Cooking / Smoking

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The smoking process should be considered equivalent to a cooking process and must comply with all internal time-temperature cooking requirements. This information should be recorded for each lot or batch of product processed.

**Hot smoked meats products** should reach an internal temperature of 148°F (64°C) for 115 seconds or equivalent as recommended by the USDA - Lethality Performance Standards for Certain Meat and Poultry Products ([https://www.fsis.usda.gov/wps/wcm/connect/d9932e95-49da-4c98-a55e-246036571fc6/95-033F\\_tech\\_paper.pdf?MOD=AJPERES](https://www.fsis.usda.gov/wps/wcm/connect/d9932e95-49da-4c98-a55e-246036571fc6/95-033F_tech_paper.pdf?MOD=AJPERES)). The cooking temperature and time should be monitored and documented (Appendix 5 - Cooking / Smoking Log). A calibrated, automatic



recording thermometer with internal product temperature probes or calibrated metal-stemmed thermometer should be available and used during the smoking operations.

**Cold smoked meat products** should be processed at or near ambient temperature to minimize time-temperature abuse. The product and air temperature shall be monitored at all times. This process does not preserve the products or reduce food safety hazards. It is typically used to apply smoke color or flavor.

## Preparation – Chilling

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Once the hot smoking process step is complete, the hot meat products should be cooled to an internal product temperature of 70°F (21°C) within 2 hours and to 41°F (5°C) or less within an additional 4 hours. Total cooling time should not be longer than 6 hours. Cooling times and temperatures should be documented for each lot.

If cold water showering is used to rapidly chill product temperature after hot smoking, it must be potable water that contains a chlorine residual and it may not be recirculated unless by an approved method. If the water is reclaimed, it must be discarded daily.

## Display

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Display involves holding the finished products in temperature control units for a specified duration and condition for public sale.

**The specialty meats that require refrigerated storage (not shelf-stable) should be displayed in units maintained below  $\leq 41^{\circ}\text{F}$  ( $5^{\circ}\text{C}$ ).**

**Display units are maintained in a clean, sanitized and orderly manner.**

**Food is properly labeled with “Appropriate Handling Instructions” (Appendix 3 - Product Labels).**

1. Food Safety Hazards

2. Calibrations

3. Product Labels

4. Daily SOP Check List

5. Cooking / Smoking Log

## Biological

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### Hazard: Pathogen growth

**Problem:** Certain bacteria, i.e., *Salmonella* and *Listeria*, can contaminate and grow on ready-to-eat meat products due to poor handling of the ingredients or finished products.

**Controls:** Practice time-temperature controls for ingredients, in-process and finished product.  
Clean and sanitize equipment and utensils.  
Record daily SOP's.  
Maintain process temperatures.  
Maintain heating controls for proper time and temperatures exposure.  
Prevent contamination of finished product from the environment or food handlers.

### Hazard: Toxin forming bacteria (or molds)

**Problems:** Exposing, ingredients, product in process, or finished product to times, temperature, and conditions that permit toxigenic bacterial (i.e. *Clostridium perfringens*, *Clostridium botulinum*, etc.) or molds to grow and produce toxin.

**Controls:** Practice time-temperature controls for ingredients;  
Provide active fermentation cultures during fermentation to suppress toxin formation.  
Control drying of finished product to either make it shelf-stable product or keep it refrigerated.

### Hazard: Surviving infective pathogens

**Problems:** Consumption of certain undercooked, cured and fermented products that may contain 'live' infective bacteria such as *Escherichia coli* O157:H7, *Salmonella*, or *Listeria monocytogenes* or live parasites such as *Trichinella spiralis* in pork.

**Controls:** Implement a lethal treatment designed to inactivate these biological hazards in the finished product. Use of nitrite/nitrate prevents outgrowth and toxin production of *Clostridium botulinum*.

## Chemical

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### Hazard: Chemical contamination

**Problems:** Raw materials may arrive with chemical contamination unless proper controls are in place.

**Controls:** Purchase from reliable and identifiable source, with a HACCP plan to control antibiotic residues, pesticides, and growth promotants. These plans and records may be obtained on request. Verify appropriate amounts of curing chemicals are added by using calibrated and certified scales or pre-weighed packets.

## Physical

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**Hazard: Metal fragments**

**Problems:** Physical hazards (i.e., metal fragments) can be introduced or received in product.

**Controls:** Purchase from reliable and identifiable source that maintain HACCP plans and records that can be accessed on request. Maintain equipment and protect product to prevent physical contaminants and /or install calibrated metal detector.

## Temperature Monitoring Devices – Thermometers

Many types of thermometers and temperature recording devices are readily available for use in food handling operations. We recommend thermistors, thermocouples and infrared thermometers with either a digital or analog readout. All of these instruments are acceptable for use in the food processing operations as long as the operator understands how they are used and if they are calibrated for proper readings.



The method and frequency of calibration for thermometers will depend on the use and temperature range where the equipment is used. In the absence of manufacture's recommendations, thermometers should be calibrated at least once a month with more frequent calibrations when the instrument is physically abused or if the readings are questionable.

### Temperature Monitoring Devices (TMD) - Calibration Procedures (options):

- a. TMD's can be calibrated against a thermometer certified by the National Institute of Standards and Technology (NIST) by simply comparing both units at two preset temperatures (hot and cold).
- b. TMD's can be calibrated using an ice-water slush. Insert the temperature probe into a mixture of ice and water slush and stir (2-3 min) until the thermometer stabilizes. The probe should be at the center of the container. The thermometer should read  $32\pm 1^{\circ}\text{F}$  ( $0\pm 1^{\circ}\text{C}$ ). Adjust accordingly or discard and replace the faulty thermometer.
- c. Hot point calibration is used when monitoring temperatures higher than room temperature (e.g., cooking temperatures). Heating blocks or boiling water can be used for this calibration. When using the boiling water procedure, the probe is placed inside a container with boiling water until the thermometer stabilizes (2-3 min). The probe should be at the center of the container. The thermometer should read  $212\pm 1^{\circ}\text{F}$  ( $100\pm 1^{\circ}\text{C}$ ) or appropriate temperature according to elevation (Table 1 - Altitude to Boiling Point of Pure Water Relationship). Adjust accordingly or discard and replace the faulty thermometer.
- d. A combination of the procedures b and c is recommended for a more accurate calibration of thermometers used to monitor a wide range of temperatures.



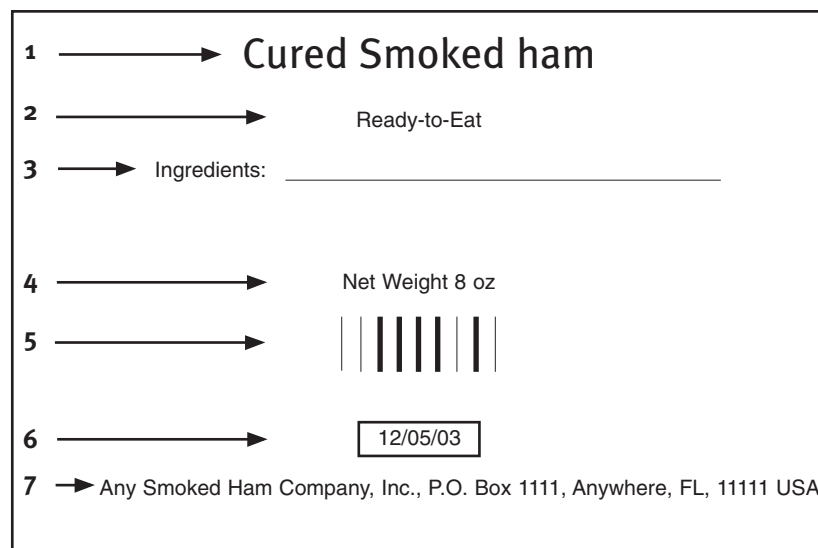
## Altitude to Boiling Point of Pure Water Relationship

Feet Above Sea Level	Boiling Point (°F)
0	212
500	211
1,000	210
1,500	209
2,000	208
2,500	207
3,000	206
3,500	205
4,000	204
4,500	203
5,000	203
6,000	201
7,000	199
8,000	197
10,000	194
12,000	190
14,000	187

Source: Thermometer Calibration, food safety webpage, University of Nebraska Cooperative Extension  
(<https://food.unl.edu/thermometer-calibration-information-and-measuring-ph-meat>)

All specialty product sold through display in a retail setting must contain certain details on the product label that informs the consumer and could prevent potential food safety problems. The detail provided on this example includes both required and recommended information. The actual placement and size of the labeled information can vary. The example is enlarged for illustration.

1. Product name used to describe the product. The descriptive name should be in common terms associated with the product and recognized by the consumer.
2. Ready-to-Eat statement and instructions for safe handling and consuming the product.
3. Product ingredients listed in descending order by weight.
4. Net weight and pricing information.
5. Bar code for product inventory and identity.
6. Lot or date code.
7. Company name and address.



Note: This would not apply for bulk displayed items.

Disclaimer: This label is simply provided as a guide. Retailers should consult with their local authorities to assure compliance with more immediate requirements in their region

# Appendix 4

# Daily SOP Check list

Store Name/Number: \_\_\_\_\_

DATE: \_\_\_\_\_

Storage	Time/Temp	Time/Temp	Time/Temp	Time/Temp
Refrigerators (°F / Time)	°F	°F	°F	°F
Freezers (°F / Time)	°F	°F	°F	°F
Display	Time/Temp	Time/Temp	Time/Temp	Time/Temp
Display temperature (°F / Time)	°F	°F	°F	°F
Clean and Orderly. Food in good condition and properly labeled.				

### SOP CHECK LIST

Work Area	Comments			
Orderly; Clean and Sanitized tables, countertops and sinks. Orderly, all work surfaces cleared. Clean floor and drains				
Proper storage and labeling of chemicals and cleaning items				
Wet and dry trash separate and removed from work area.				
All utensils, pots, pans, bowls, cutting boards, cooking or heating equipment properly cleaned and sanitized.				
Thermometer and recorder available and calibrated				
Personnel				
Personnel Health, hand-washing practices, glove use, clean and well maintained outer garments, proper hair covering and no jewelry.				
Food Storage				
All food protected, dated and labeled properly Refrigerators and freezers clean, orderly and operating correctly.				
	Pre-Op	Time	Post-Op	Time
Employee Initials				
Manager Review				

This particular form is not mandated but it does indicate information that should be recorded to demonstrate an appropriate process for food safety. Different and additional forms can be used to record the same information.



Processing Date: \_\_\_\_\_

Lot # Batch	Final Product Internal Temp.	Time at Final Internal Temp.	Performed By
<p><b>Comments:</b></p>  <p><b>Process Target:</b>  <b>Internal temperature of 148°F for 115 seconds for Cured &amp; Smoked Hams and Pork Loins.</b></p>			

Reviewer's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

This particular form is not mandated but it does indicate information that should be recorded to evidence an appropriate process for food safety. Different and additional forms can be used to record the same information.





