

Introduction to Meat Product Processing

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Key concepts, stages, and safety considerations

1. Overview

- **Definition:** Meat product processing transforms raw animal muscle (meat) into safe, stable, and market-ready foods such as fresh cuts, cured meats, sausages, and ready-to-eat (RTE) items.
- **Goals**
 1. **Safety** – eliminate or control pathogens and spoilage organisms.
 2. **Shelf-life extension** – retard microbial growth, oxidation, and enzymatic changes.
 3. **Quality & appeal** – achieve desired texture, flavor, color, and appearance.
 4. **Economic efficiency** – maximize yield and add value.

2. Primary Processing Steps

Step	Purpose	Typical Operations	Critical Control Points (CCPs)
1. Receiving & Inspection	Verify animal health, weight, and quality	Visual inspection, temperature check, documentation review	Receiving temperature $\geq 4^{\circ}\text{C}$; reject diseased carcasses
2. Slaughter & Evisceration	Separate edible parts, remove contaminants	Stunning, bleeding, hide removal, gutting	Hygiene of equipment, rapid cooling of carcass
3. Chilling	Reduce temperature to inhibit microbial growth	Blast chilling ($0\text{--}4^{\circ}\text{C}$) or spray chilling	Core temperature $\leq 4^{\circ}\text{C}$ within 2 h
4. Cutting & Deboning	Produce primal and sub-primal cuts	Sawing, trimming, bone removal	Clean cutting surfaces; cross-contamination control
5. Grinding / Mincing (if required)	Create uniform particle size for further products	Grinder, mixers, emulsifiers	Metal detection; temperature $\leq 4^{\circ}\text{C}$

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6. Formulation & Mixing	Incorporate ingredients (salt, spices, curing agents)	Batch mixers, tumblers	Accurate dosing of additives; pH monitoring
7. Shaping & Stuffing	Give product its final shape	Sausage casings, molds, extruders	Uniform fill weight; avoid air pockets
8. Cooking / Heat Treatment	Kill pathogens, set texture	Steam, oven, water bath, smoking	Internal temperature ?? 71°C (depending on product)
9. Cooling / Rapid Chilling	Prevent post-cook bacterial growth	Ice-water bath, chilled air	Core temperature ?? 4°C within 2h
10. Packaging	Protect product, extend shelf life	Vacuum, MAP (modified atmosphere), skin packs	Seal integrity; oxygen level control
11. Storage & Distribution	Maintain product quality until purchase	Refrigerated or frozen storage, cold chain logistics	Temperature compliance throughout transport

3. Major Processing Technologies

Technology	Application	Key Effects
Curing (dry & wet)	Salami, ham, bacon	Reduces water activity, adds flavor, inhibits microbes
Smoking	Sausages, jerky, smoked ham	Imparts aroma, antimicrobial phenols, additional drying
Fermentation	Salami, pepperoni	Lactic acid bacteria lower pH, develop flavor, improve safety
Dry-Aging	Premium steaks	Enzymatic tenderization, flavor concentration
High-Pressure Processing (HPP)	RTE deli meats	Inactivates pathogens without heat, retains fresh-like quality
Irradiation	Ground meat, spices	Reduces microbial load, extends shelf life