

# **The Complete Book on Meat Processing and Preservation with Packaging Technology**

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Meat was originally processed to preserve it, but since the various procedures cause so many changes in texture and flavour it is also a means of adding variety to the diet. Processing also provides scope to mix the less desirable parts of the carcass with lean meat and in addition is a means of extending meat supplies by including other foodstuffs such as cereal in the product. Food preservation is a method of maintaining foods at a desired level of properties or nature for their maximum benefits. Preservation usually involves preventing the growth of bacteria, yeasts, fungi, and other micro organisms (although some methods work by introducing bacteria, or fungi to the food), as well as retarding the oxidation of fats which cause rancidity. Today, meat is processed with salt, colour fixing ingredients, and seasonings in order to impart desired palatability traits to intact and comminuted meat products. Products intermediate to these categories are sectioned, or chunked and formed meats. There are various methods for the preservation of meat; curing, dry curing, smoking, canning, freezing dehydration, fat extraction (wet or steam rendering), etc. Meat curing agents include sodium chloride, nitrite, ascorbate or erythorbate and possibly sodium phosphate, sucrose, dextrose, or corn syrup and seasonings. The salt content of processed meats varies 1 to 12%, according to the type of product. Many intact and comminuted, cured meat products are smoked to impart a desirable smoked flavour and colour. The smoking process many also include a drying or cooking cycle, depending on the product. Canned meats may be processed to be commercially sterile or semi preserved. The objective of commercial sterilization is to destroy all harmful bacteria or bacteria that may cause spoilage of the product under normal unrefrigerated storage. However, the process does not kill the spores of all heat resistant bacteria. Frozen meat can be kept at low temperatures for many months. Freezing and subsequent thawing produce changes in the structure of meat that affect its physical properties. If meat is frozen very rapidly at low temperatures, the ice crystals are small and form within the fibers. The drip loss upon thawing is generally greater in slow frozen than in quick frozen meat. Freeze drying meat extends shelf life and reduces weight. The meat is readily defrosted by immersing in water before cooking. Under optimum processing and storage conditions, reconstituted meats have acceptable flavour, colour, texture and nutrient retention.

The meat packing industry handles the slaughtering, processing, packaging, and distribution of animals such as cattle, pigs, sheep and other livestock. The basic purpose of packaging is to protect meat and meat products from undesirable impacts on quality including microbiological and physio chemical alterations. Packaging protects foodstuffs during processing, storage and distribution from contamination by dirt (by contact with surfaces and hands), microorganisms (bacteria, moulds, and yeasts), parasites (mainly insects), toxic substances (chemicals),

influences affecting colour, smell and taste (off odour, light, oxygen), loss or uptake of moisture. As such, due to the recent up gradation of preservation techniques, the preservation industry is also growing almost at the same rate as the food industry which is about 10 to 12% per year. Some of the fundamentals of the book are meat product, simultaneous flavouring and tenderizing, synthetic flavouring, preservation: moisture retention and surface protection, antimicrobial treatment, antioxidant application to freeze dried meats, packaging and handling for storage and transportation, continuous steam cooking of ground meat, activators of natural proteolytic enzymes, isotonic enzyme solution with specific activity, inactivation of enzymes with high pressure, etc.

The origin of meat processing is lost in antiquity but probably began when primitive humans first learned that salt is an effective preservative and that cooking prolongs the keeping quality of fresh meat. This book includes the processing of fresh meats, the different curing agents, method of curing, smoking and manufacturing of various meat products such as sausages, canned meat, cured and smoked meats etc. The book is very useful for entrepreneurs, technocrats and those who want to venture in to this field.

## 1. MEAT PRODUCT

Curing

Comminution

Smoking

Canning

Freezing

Dehydration

By-Products

## 2. TENDERNESS

Feed Additives

Balanced Electrolyte Composition

Ante-Mortem Enzyme and other Treatments

Stabilized, Purified Enzyme Preparation

Enzyme and Antibiotic Synergism

Controlled Enzyme Distribution

Uniform Enzyme Distribution

Treated and Standardized Enzyme Solution

Activators of Natural Proteolytic Enzymes

Collagen Diminution Agents

Reversibly Inactivated Enzymes

Pre-Rigor Mortis Enzyme Treatment

Enzyme and Antibiotic Synergism

Tenderization of Connective Tissue

Cold Water Buffered Enzyme Solution

Isotonic Enzyme Solution with Specific Activity

Buffered Enzyme Combined with Gelatin

Pre-Rigor Mortis Injection

Water Injection

Water and Gas Injection

Water and Cellulose Gum Injection

Whole Blood or Whole Milk Injection

Post-Rigor Mortis Enzyme Treatment

Tenderizer Composition

Aerosol Tenderizing Compositions

Enzyme with Higher Sodium Phosphates

Enzyme with Basic Pyrophosphate Salts

Balanced Activity of Papain and Bromelin  
Enzyme with Nonlinear Phosphates in Saline  
Enzyme and Fat Combination  
Gas as Tenderizer Carrier  
Inactivation of Enzymes with High Pressure  
Carbon Dioxide or Oxygen Atmosphere  
Enzyme, Chelating Agent, and Starch  
Tragacanth Addition  
Meat Pieces with Tenderized Core  
Aging at Elevated and Controlled Temperatures  
Variable Dew Point Control  
Vacuum Packaged Cuts  
Diathermal Heating  
Controlled Atmosphere  
Electron Beam Generator Radiation  
Forced Dry Air Circulation  
Treatment with Additives  
Sodium Chloride and Pyrophosphate Synergism  
Increased Injection Level of Sodium  
Chloride and Phosphate  
Marination and Refrigeration  
Sodium Bicarbonate and Vinegar  
Treatment with High-Pressure Gaseous Atmosphere  
Oxygen  
Carbon Dioxide  
Solution Application Devices  
Automatic Spraying Apparatus  
Jet Injection Apparatus  
Mechanical Tenderizing  
Composite Steaks by Mechanical Method  
Composite Steaks by Cryogenic Method  
Compressed Cuts Mechanically Tenderized  
Action of Supersonic Energy  
Isometric Tensioning  
Method for Tenderness Measurement  
Tenderness Measuring Apparatus

### 3. FLAVOUR AND TENDRENESS

Simultaneous Flavouring and Tenderizing  
Action of Molds and Bacteria  
Action of *Thamnidium elegans*  
Pre-Rigor Mortis Injection of *Aspergillus niger* Mycelium  
Acid Activation of *Thamnidium elegans*  
Anta-Mortem injection of *Thamnidium* and *Aspergillus*  
*Thamnidium* and Antibiotic Synergism  
Action of *Pseudomonas* and *Achromobacter*  
Combined Action of Flavouring and  
Tenderizing Agents  
Monosodium Glutamate Eliminates Mutton Flavour  
Application of Dry Tenderizer and Flavouring Materials  
Inhibition of Warmed-Over Flavour

### 4. FLAVOURING

Meat Hydrolyzates and Extracts  
Acid Hydrolysis of Water-Insoluble Meat Residue

Fractionation of the Flavour Precursor

Hydrolysis of Meat

Bone Hydrolysates and Extracts

Continuous Counterflow Hydrolysis

Continuous Hydrolysis

Protein Hydrolysate

Synthetic Flavouring

Cysteine and Glyceraldehyde Base

Cysteine and Ribose

Derivatives of Mercapto-Acetaldehyde

$\alpha$ -Ketobutyrate, Inosinate, and Glutamate Base

Nitrite and Amino Acids

Cysteine, Sugar, Inosinate, and Protein Hydrolysate Base

Cysteine, Thiamine and Proteinaceous Substance Base

Ribose, Glycerol, Proline, Cysteine, and Methionine

Amino-Carbonyl Complexes from Protein Hydrolysates

Heat-Treated Slurried Meat and Ascorbic Acid

## 5. COLOUR

Ante-Mortem Treatment

Adrenalin and Ascorbic Acid

Treatment with Gaseous Atmosphere

Carbon Monoxide

Oxygen Under Pressure

Ammonia

Hemoglobin Base Colouring Compositions

Stable Compositions in Liquid and Paste Form

Compositions in Dry Powder Form

Chemical Treatment

Certified Monoazo Red Dyes

Ascorbate, Phosphate, and Citrate

Ascorbate, Gelatin, and Monosodium Glutamate

Imidazole

Metal Ions Ashed from Biological Tissues

Beta-Carotene

Nicotinic Acid Spray

Mechanical Treatment

Removal of Residual Blood

Protection of Bone Colour of Primal Cuts

## 6. INTEGRAL TEXTURE

Natural Exudate as Binder

Surface Treatment to Release Exudate

Mechanical Pricking to Release Exudate and

Freezing to Integrate

Compression to Release Exudate

Cryogenic Method

Enzyme Sodium Chloride Binding Action

Salt-Soluble Proteins

Scoring to Release Exudate

Polyphosphate as Bonding Agent

Polyphosphate Injection

Repeated Slow Freezing and Thawing

Binding Agents

Wheat Gluten

Gums

Binding Matrix

## 7. PRESERVATION : MOISTURE RETENTION AND SURFACE PROTECTION

Long Chain Hydrocarbon Coating

Fatty Alcohol or Fatty Acid Protective Film

Preliminary Ice Coating

Intermediate Glycerol Layer

Intermediate Water Layer

Lactic Acid-Fatty Acid Triglycerides

Water-in-Oil Emulsion Containing Gum

Mixture of Mono- and Diglycerides in Oil

Acetylated Monoglycerides

Plastic Coating

Ethylcellulose Plasticized with Mineral Oil

Ethylcellulose Plasticized with Edible Oil

Plasticized Cellulose Propionate Containing Glycol

Amorphous Polypropylene

Chemical and other Treatments

Sodium Chloride and Phosphate Solution

Injection of Water and Citric Acid

Hydrated Sodium Tripolyphosphate

Coating Powder Containing Syrup and Starch

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Antibiotics

Ante-Mortem Injection

Ante-Mortem or Post-Mortem Injection

Combined with Air-Tight Packaging

Treated Absorbent Material

Coated or Impregnated Packaging Material

Addition of Nystatin or Myprozine

Various antimicrobial and Antimicrobial Agents

Plant Extracts

Spore Germination with Gibberellin

Sterilization with Nitric Oxide Atmosphere

Ethylene and/or Propylene Oxide to Destroy Trichinae

Increased Acidity to Destroy Foot-and-Mouth Virus

High Pressure Carbon Dioxide or Oxygen Atmosphere

Thermal Decontamination and

Oxygen Impermeable Packaging

Chlorine-Containing Aqueous Spray Solution

Microbial Spoilage Indicator

Design and Compositions

## 9. IONIZING RADIATION

High Pressure Oxygen Atmosphere to Improve Colour

Combusted Fuel Gas Atmosphere to Improve Flavour

Ante-Mortem Adrenalin Injection to

Retard Enzymatic Deterioration

Antibiotic and Sorbic acid Treatment

Saline Medium to Eliminate off-Flavours

Sodium Chloride and Nitrite or Nitrate as

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Sterilization with Carbon Dioxide under Pressure

Sodium Chloride Treatment Prior to Blanching  
Irradiation Apparatus  
Design of a Resonant Transformer Type Cathode Ray  
Irradiator

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Solvent Dehydration  
Drying Without Case Hardening  
Preservation of Flavor  
Antioxidant Application to Freeze-Dried Meats  
Deodorization of Raw Meat

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Various Methods of Packaging  
Vacuum Packaging and Storage Below 5°C  
Hot Carcass Processing and Impermeable Packaging  
Vacuum Packaging and Hot Water Spraying  
Processing of Partially Cooled Carcass  
Controlled Atmosphere Environment  
Cryogenic Oxygen-Nitrogen Atmosphere  
Carbon Dioxide-Oxygen-Nitrogen Atmosphere

## 12. COOKING METHODS

Broiling in Oxygen-free atmosphere with  
Intense Infrared Heat  
Continuous Steam Cooking of Ground Meat  
Controlled Electrical Cooking  
High Pressure Roasting in Air Medium  
Cooking Between Compressed Plates  
Roasting in Suspended State

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Water and Cellulose Gum Injection  
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Balanced Activity of Papain and Bromelin  
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Gas as Tenderizer Carrier  
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Mixture of Mono- and Diglycerides in Oil  
Acetylated Monoglycerides  
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Ethylcellulose Plasticized with Edible Oil  
Plasticized Cellulose Propionate Containing Glycol  
Amorphous Polypropylene  
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