

# PROCESSED MEATS

# Processed Meat

- One of the largest, most diverse aspects of the industry
- A way small meat processors add value to their business



# Ingredients/ Labels

- What are the purpose of all the ingredients?
- Anything added to the fresh meat block must have an ingredient label
- List from the highest concentration to the lowest concentration
- Allergens must be declared on the label

INGREDIENTS: Beef, Worcestershire Sauce (Distilled Vinegar, Molasses, Corn Syrup, Water, Salt, Caramel Color, Garlic Powder, Sugar, Spices, Anchovies, Tamarind, Natural Flavor), Salt, Soy Sauce (Water, Protein Extracts from Soybeans, Salt, Corn Syrup, Caramel Color, Potassium Sorbate), Flavorings, Monosodium Glutamate, Onion, Garlic, Sodium Nitrite, Bromelain.



# Food Allergens

- Protein based; immune reaction
- Over 160 foods cause allergic reactions
- **Bolded or labeled separately**
- **Most common (90%):**
  - Milk
  - Eggs
  - Fish (e.g. bass, flounder, cod)
  - Shellfish (e.g. crab, lobster, shrimp)
  - Tree Nuts (e.g. almonds, pecan, walnuts)
  - Peanuts
  - Wheat
  - Soybeans
- **“Anaphylactic Shock” in major cases**



# Salt

- **Makes proteins “sticky”**
  - Creates a “bind” with other proteins
- **Bacteriostat**
- **Aids in the removal of water**
- **Flavor enhancer**
- **Normally used at 2% +**



# Sweeteners

- Added to counteract the harshness of salt
- Sugar (white or brown), corn syrup, corn syrup solids, dextrose, fructose, etc
- Contributes to surface browning
- Provide energy source for lactic acid producing bacteria in fermented sausages



# Phosphates

- **Increase water – holding capacity**
  - Increases pH
  - Isoelectric point
- **Less moisture loss during cooking**
- **Cannot exceed 0.5%**
- **Soapy flavor at high concentrations**
- **Mix first, hard to dissolve in water**





# Antioxidants

- Retard rancidity
- BHA (Butylated hydroxyanisole)
- BHT (Butylated hydroxytuleane)
- TBHQ (tert – Butylhydroquinone)
- Propyl Gallate
- Tocopherols (Vitamin E)





# Nitrites/ Nitrates

- **Why?**
  - Fix the color of cured meat products
  - Flavor
  - *Clostridium botulinum*
- **Sodium nitrite**
- **Potassium nitrite (salt peter)**
- **Nitrates used in dry cured meats**



# Nitrites/ Nitrates

- **Can be carcinogenic (MIT study)**
  - Need to eat 40 lbs of bacon/ d for 40 years
- **Bacon 120 ppm**
- **Hams & Sausage products 200 ppm**
  - 1 pound in 5,000 pounds of meat
- **We now see in influx of “no nitrite added” or “uncured” meat products**
  - Adding vegetable powders, juices, extracts or sea salt – all contain natural levels of nitrites

**Myoglobin**



**Add Nitrite**

**Nitric Oxide Myoglobin**



**Heat**

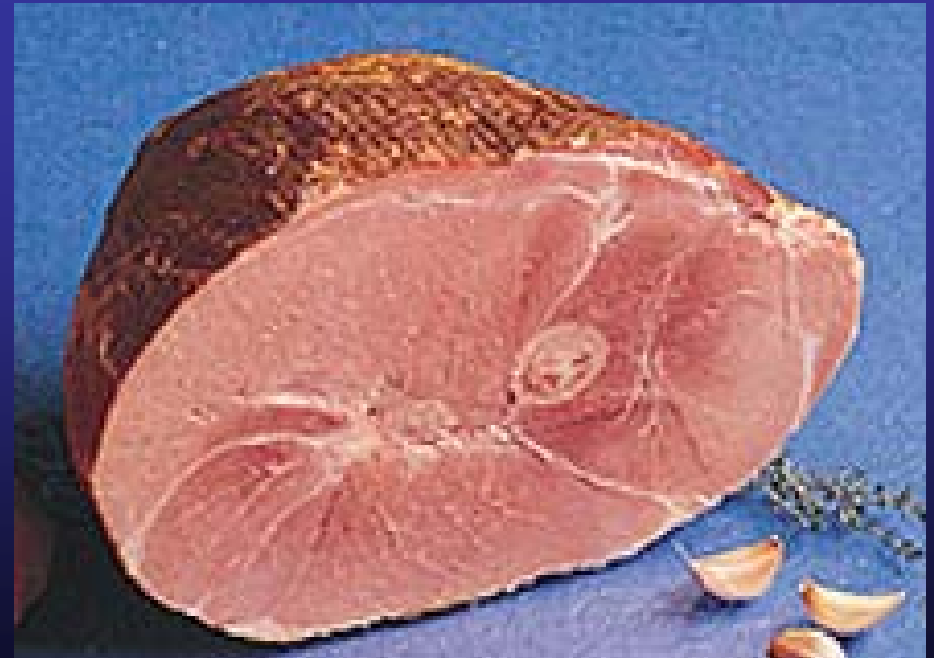
**Nitrosylhemochromin**

# Nitrosylhemochromagen

- Name of the protein responsible for cured meat color
- Very heat stable; no major color changes upon cooking
- Very susceptible to light and oxygen
- Light Fading
  - Fluorescent lights + Oxygen
  - Brownish – gray color develops
  - Still safe to eat

# Sodium Erythorbate

- Cure accelerator
- Nitrosylhemochromagin
- Synthetic form of Vitamin C
- Stabilize color
- **NOT EARTHWORMS!!**
  - Urban legend



# Flavorings/ Seasonings

- Generalized description
- Things added to create a specific flavor
- Do not have to declare if 2% of total ingredients or less
- Designed not to give away secrets



# Extenders and Binders

- **Improve stability**
- **Improve water holding capacity**
- **Enhance texture and flavor**
- **Reduce shrinkage during cooking**
- **Improve slicing characteristics**
- **Reduce formulation costs**



# Extenders

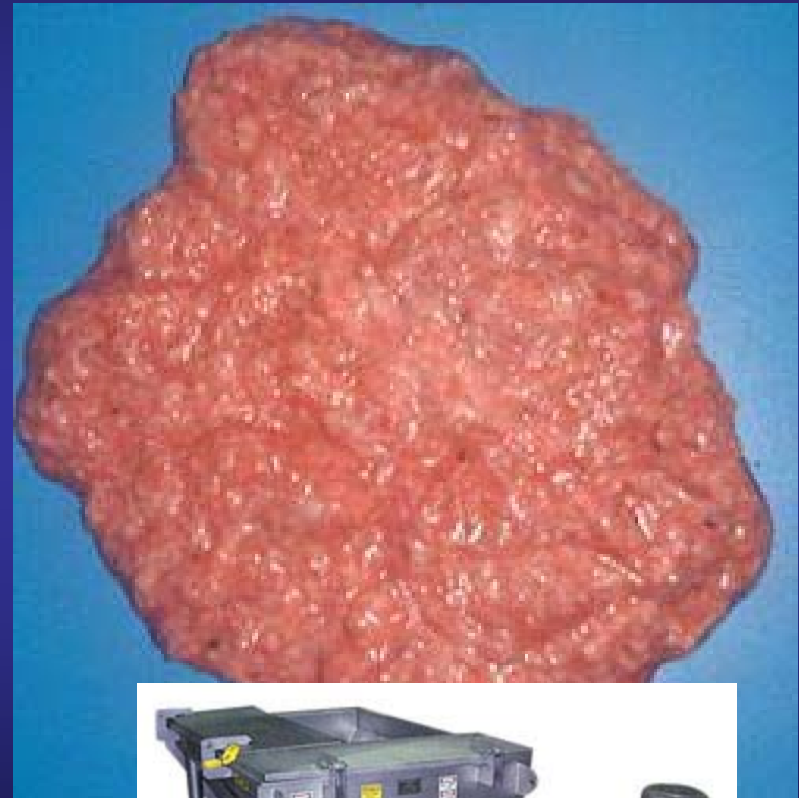
## Commonly used:

- Soy products
  - Flour
  - Grits
  - Protein concentrates
  - Isolates
- Textured Vegetable Proteins
- Nonfat dried milk solids
- Dried Whey
- Cereal flours
- Starches



# Mechanically De-boned Meat

- Commonly found ingredient in hot dogs, bolognas, etc
- Method of removing meat from the bones
- Beef, pork, chicken, turkey, some seafood



# Sausage

- **The most common way to add value to a meat processing company**
- **Many, Many types of sausage**
- **More than just fresh ground pork with seasonings added**
- **The majority of the lunchmeat pegboard or the deli are considered sausage!**

# The Wide World of Sausage

- One of the oldest preservation methods
- Spices and seasoning available dictated the flavor of the sausage
- Sausage became regional
- Can be made from any species (beef, pork, lamb, goat, water buffalo, camel, elk, deer, etc)



# Types of Sausage

- *Fresh Sausage*
- Made from fresh, uncured, uncooked meat
- Most common type
- Breakfast Sausage, Bratwurst, Italian Sausage, Mexican style Chorizo





# Sub-Category

- *Pre-rigor Sausage or Whole Hog Sausage*
- Rigor = “stiffness of death”
- ~45 min from live animal to package of sausage
- Spent sows and maybe boars
- Better water holding capacity, better seasoning holding, better color



# Types of Sausage

- *Uncooked Smoked Sausage*
- Smoked, but not cooked and must be cooked before eating
- Country-style Sausage, Mettwurst





# Types of Sausage

- *Cooked and/ or Smoked Sausage*
- Cooked and smoked or cooked and not smoked
- Liver Sausage, Smoked Sausage, modern Kielbasa, Braunschweiger



# Types of Sausage

- *Dry and Semidry Sausage*
- Fermented sausage
- Air dried, like a country ham
- Pepperoni, Sommer (Summer) Sausage, Genoa Salami

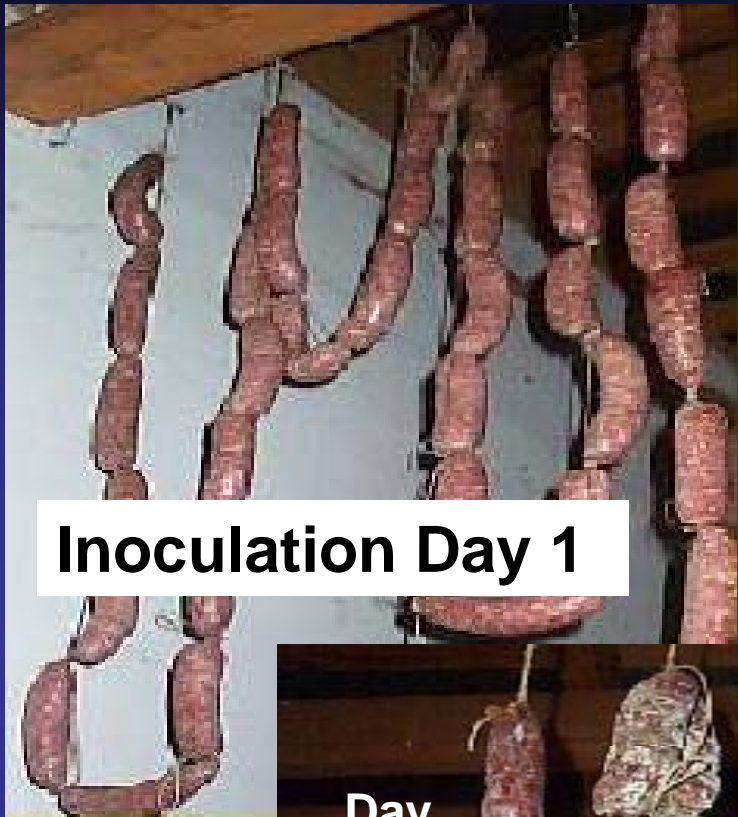


# What is a dried or semi-dried sausage?

- **Dry Sausage**
  - **Pepperoni, Genoa Salami, Dry Salami, etc.**
  - **lower temperature & longer process than for semi-dry**
  - **ferment to pH 4.6**
  - **$a_w = .85 - .91$  (shelf stable)**
  - **proteolysis & lipolysis**
    - **resulting in flavor development**

# What is a dried or semi-dried sausage?

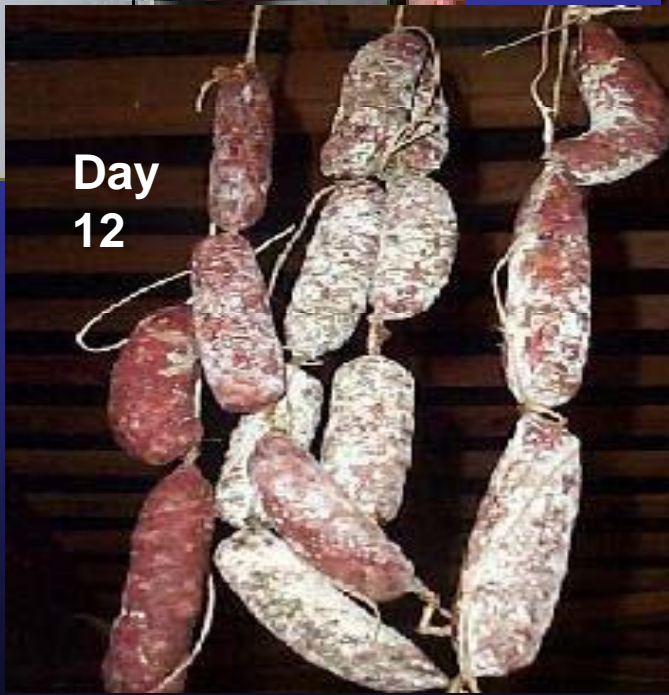
- **Semi-dry sausage**
  - summer sausage
  - ferment to  $< \text{pH } 5.3$
  - fully cooked ( $155^{\circ}\text{-}160^{\circ}\text{F}$ )
  - $a_w = .90 - .94$  (not shelf stable)
- **Non-refrigerated semi-dry**
  - $\text{pH} < 5.0$
  - m:p ratio  $< 3.1$
  - fully cooked/natural smoke



**Inoculation Day 1**



**Day 5**



**Day 12**



**Day 14**



# In the days of old....

- Fermented & dried sausage to preserve the meat
- Low pH <5.3 – 5.0
- Reduces bacterial loads
- Low  $A_w$  <0.90
- Known as Hurdle Technology
  - Method of preservation, where you identify the various aspects that need to be controlled to create a shelf-stable product



# In the days of old....

- Flavor became distinct to butcher shop
- Back-sloping – saving a previous batch to mix with new batch; inoculating
- Caused some problems in the '60's & '70's
- Starter culture has replaced this practice





# Bacteria in Starter Cultures

- *Pediococcus acidilacticii*
- *Lactobacillus plantarum*
- *Micrococci*
- 1958 - first starter cultures available to meat industry



# Meat pH Controlled by:

- Quantity of sugar (dextrose) added
- Fermentation temperatures
  - culture specific
- Fermentation time, before cooking
  - minimize time to pH 5.3 (to reduce chances of Staph toxin)
  - 6 to 18 hrs

# Sausage Acidification

- Add acids instead of fermentation
- Add encapsulated citric acid, sodium acid pyrophosphate, Glucono - $\delta$ -lactone : 0.5% (GDL)
- Acid taste; but not the same as fermentation
- Over acidification can lead to soft, spongy, watery sausage
- Hickory Farms

# Types of Sausage

- *Emulsified Sausage*
- What is an emulsion?
  - Fat suspended in a water, protein matrix
- Hot Dogs, Bologna, Pickle Loaf, Cheese Loaf
- What are Hot Dogs really made of?
- Majority of the lunchmeat case will fit into this category



# Types of Sausage

- *Specialty Sausage*
- Made from specialty meats such as tongue, head meat, and blood
- Usually demand a higher price!!
- Tongue and Blood Sausage, Head Cheese, and Souse



# Goetta

- “Cincinnati caviar”
- Very regional to Cincinnati, Southwestern Ohio, and Northern Kentucky
- Old German Sausage
- Pork boiled off the bone with seasoning, mixed with pinhead oats or steel cut oats







**LOUIS BILLS,**  
**Pork and Beef Packer,**  
AND PROPRIETOR OF THE  
**GREAT SOUTHERN STEAM SAUSAGE FACTORY.**



# Types of Casings

- Cellulose
- Inedible collagen
- Edible collagen
- Plastic
- Natural



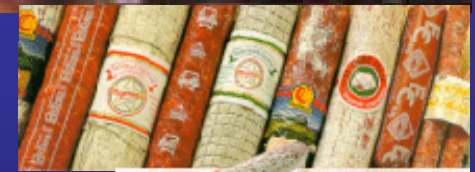
# Cellulose

- Plant derived
- Wood pulp
- Close to the formula of TNT
- Inedible
- Coated with smoke, edible water soluble dye, anti-bacteria, or coatings for easy removal
- Large sausages



# Edible/ Inedible Collagen

- Connective tissue from hide removal
- By-product of leather industry
- Uniform size; but shrink and expand
- Snack sticks, bratwurst, smoked sausage



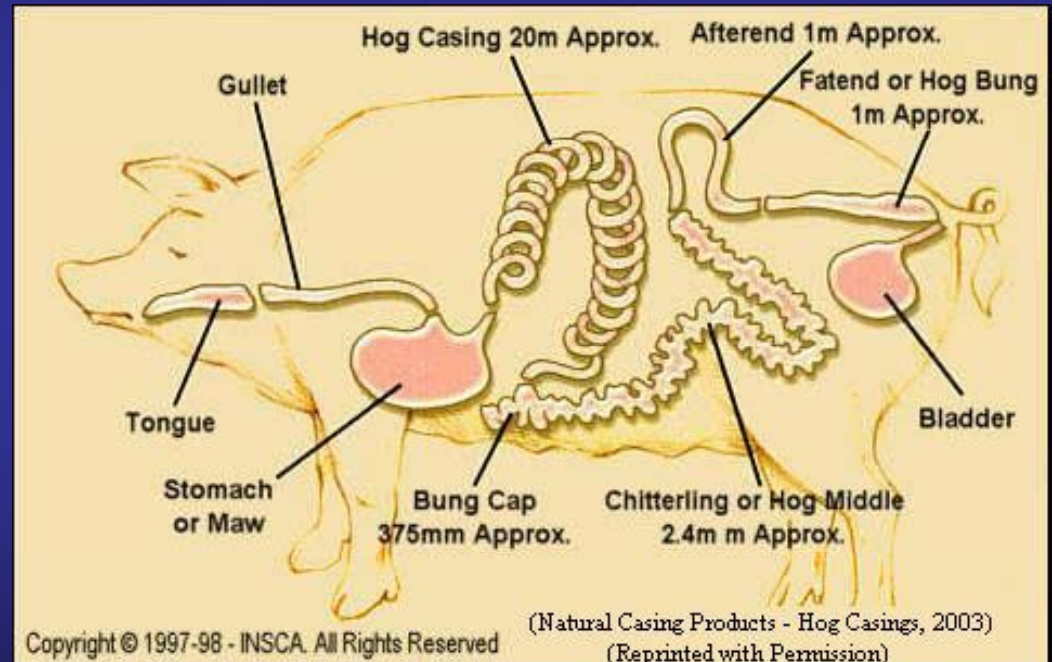
# Plastic

- Inedible
- Plastic chubs
- Impermeable to smoke, water, etc
- Can and usually display company logo, ingredients, nutrition label, etc



# Natural Casings

- Made from anything
- Beef, Pork, Lamb, etc
- Bung Bologna
- Beer Salami – beef bladder
- Liver sausage – hog bung
- Head cheese – hog stomach
- Large and small intestine



**Questions?**