



# Meat Curing Ingredients and Definitions

**Non Meat Ingredients in Processing**

# Non Meat Ingredients

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- Some of the most common non meat ingredients with meat processing are
  - Water
  - Salt
  - Nitrite
  - Cure Accelerators
  - Phosphates
  - Flavouring Agents
  - Sweeteners
  - Binders & Extenders
  - Fermenting agents

# Water

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Increased yield is the most common reason water is added to processed meat products today.

- Add juiciness to product
- Helps distribute ingredients
- With the use of ice temperature control as well as added water achieved

# Nitrate

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- Primary function is to protect against botulism
- Converts to nitrite over time
  - Body converts nitrate in vegetables into nitrite
  - Nitrate is converted into nitrite when added to meat products (given time)
- 200ppm maximum allowed in cold cuts, 100ppm is the minimum
- 120ppm is the maximum in bacon

# CFIA and Nitrates

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- Enforces Dept. of Justice- Food and Drug Regulations
  - B14: Meat, Its Preparations and Products
  - B16: Food Additives

# Maximum In-Going Cure Limits (PPM)

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Curing Agent	Curing Method			
	Immersion	Pumped/ massaged	Comminuted	Dry Cured
<b>Sodium nitrite</b>	<b>200</b>	<b>200</b>	<b>156</b>	<b>625</b>
<b>Potassium nitrite</b>	<b>200</b>	<b>200</b>	<b>156</b>	<b>625</b>
<b>Sodium nitrate</b>	<b>700</b>	<b>700</b>	<b>1718</b>	<b>2187</b>
<b>Potassium nitrate</b>	<b>700</b>	<b>700</b>	<b>1718</b>	<b>2187</b>

Note: 1ppm = .0001%

# Nitrite used in Pure Form

## Restricted Ingredient

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$$\text{ppm} = \frac{(\text{kg nitrite}) \times 1,000,000}{\text{green weight of meat block}}$$

**\* Uncommon in most small production facilities\***

In comminuted product formula can be used to:

1. Permitted weight of nitrite, if green weight is known
2. Min green weight, if weight of nitrite is known
3. Whether or not the recipe is in compliance with regulations

# Nitrite in Curing Compounds or Mixes (PRAGUE POWDERS)

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$$\text{ppm} = \frac{(\text{kg cure mix}) (\% \text{ nitrite in mix}) (1,000,000)}{\text{green weight of block meat}}$$

In comminuted product formula can be used to:

1. Permitted weight of cure mix, if green weight is known
2. Whether or not the recipe is in compliance with regulations, if you know weight of mix, % nitrite, and the green weight

# Nitrite Used in Cured/ Pickled Products

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- Formulas for products to be pumped, massaged, injected, or immersion cured are based on the green weight of the meat block
- If nitrate and nitrite are used in formula maximums are calculated separately
  - 200 + 700

# Nitrite in Immersed Products

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- For large products: hams, bellies, shoulders...
- It takes weeks for products to reach equilibrium
- % pick-up is the total amount of pickle absorbed by the product
  - Used in the same way as % pump in massaged/ pumped products (previous slide)

$$\text{ppm} = \frac{(\text{kg nitrite}) (\% \text{ pick-up}) (1,000,000)}{\text{kg pickle}}$$

# Nitrite in Dry Cured Products

USING GREEN WEIGHT

$$\text{ppm} = \frac{(\text{kg cure mix}) (\% \text{ nitrite in mix})(1,000,000)}{\text{green weight of meat block}}$$

Formula can be used to:

1. Calculate permitted weight of cure mix, given the green weight of the meat block and the percentage nitrite in mix
2. Determine if the formula is in compliance

# Non Meat Ingredients

## Accelerators

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### Sodium Ascorbate

- Salt out of vitamin C
- Mainly used for colour retention in fresh and cured products
- Accelerates curing and stabilizes colour

### Sodium Erythorbate

- Artificial form of vitamin C
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# Non Meat Ingredients

## Phosphates

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- Phosphate made from eggs, not related to soap
  - Used in cured meats and cooked sausages to increase pH
  - Gives better binding ability / water holding ability
  - Results in higher weight retention and increases cooking yields
  - Legal limit is .5% (.005) green weight of meat block
  - Excessive use gives a soapy or iron after taste

# Non Meat Ingredients

## Spices & Flavouring Agents

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- Allspice
- Anise seed
- Bay Leaves
- Cardamom
- Celery Seed
- Cinnamon
- Clove
- Coriander
- Garlic
- Ginger
- Mace
- Mustard
- Nutmeg
- Onion
- Paprika
- Black Pepper
- Cayenne Pepper
- White Pepper
- Sage
- Savory
- Thyme

# Non Meat Ingredients

## Sweeteners

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- Single sugars are best used in fresh sausages and cured products
- Syrups (corn, maple, honey) a viable substitution
  - Honey poses risk of botulism contamination
- Multi sugars (dextrose, sucrose) have greatest effect on pH
  - Ideal for use with fermented products

Dextrose at 0.5% ingoing produces pH of approx. 5.0 – 4.9

# Binding Agents

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- Adds protein that encapsulates fat and aids in water retention
- Most binders have legal limit of 2% of green weight of meat block



# Binding Agents

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## Whey Powder (dairy):

- dry milk product
- 2% limit

## Autolysed Yeast (Maggi):

- Inactive yeast
- Contains glutamic acid
- Sodium replacement

## Deheated Mustard (AIM Starch)

- Acid remover
- Aids in peel-ability of wieners

# Binding Agents

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## Isolated Soy Protein (ISP)

- \$\$\$\$\$
- Imparts a soy flavour
- 2% limit
- Sodium Caseinate or Milk Protein
  - Adds more protein to contained meat proteins and combines with them
  - Allows for higher addition of water and fat
    - Legal limits in RTE: 15% water, 40% fat)
- Soya Protein
  - Similar to milk protein

# Non Meat Ingredients

## Starter Cultures

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- Important in fermented sausage production
  - Lactic Acid producers most common bacteria found

### Lactic Acid Bacteria

- Hurdle to competing bacteria (microbial stability)
- Responsible for lactic acid production
- Lowers pH
- Aids in coagulation of meat proteins
- Lends tangy flavour to product
- Aids in colour formation

Pediococcus & Lactobacillus

# Acidifiers

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- **Glucono delta-lactone (GDL)**, also known as gluconolactone
  - Derived from rice
  - Sometimes used in combination with bacterial product to jump start pH drop
  - Not very clean label friendly
- **Citric Acid**
  - Works aggressively giving sour taste to foods
  - Will denature proteins quickly

# $A_w$ and pH Requirements for Pathogen Control

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## Shelf Stable

- pH of 4.6 or less regardless of  $a_w$
- $A_w$  of .85 regardless of pH
- pH <5.3 and  $A_w$  <.90

# $A_w$ and pH Requirements for Pathogen Control

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## Fermented Dry

- Does not require refrigeration
- CFIA listed starter culture
- pH <5.3 and  $A_w$  <.90
- Min 2.5% salt
- Complies with degree hours
- 100-200ppm nitrate/ nitrite

# $A_w$ and pH Requirements for Pathogen Control

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## **Fermented Semi-Dry**

- Must be refrigerated
- pH <5.3
- $A_w$  >.90
- Min 2.5% salt
- Complies with degree hours
- 100-200 ppm nitrate/ nitrite

# $A_w$ and pH Requirements for Pathogen Control

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## **Air Dried/ Dehydrated**

- Beef products must undergo heat treatment for e-coli, prior to drying
- Pork products must undergo trichinosis control measure
- Dependent on  $a_w$
- Uncooked air dried product must meet requirements of fermented – dry products

# Degree Hours

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- “Degree-hours are the product of time as measured in hours at a particular temperature multiplied by the "degrees" measured in excess of 15.6°C (the critical temperature for growth of *Staphylococcus aureus*). Degree-hours are calculated for each temperature used in the process. The limitation of the number of degree-hours depends upon the highest temperature in the fermentation process prior to the time that a pH of 5.3 or less is attained.”

<http://www.inspection.gc.ca/food/meat-and-poultry-products/manual-of-procedures/chapter-4/eng/1367622697439/1367622787568?chap=18>

# Degree Hours

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- When fermentation is done at a constant temperature, operators can either use the following table or the calculation method for determining degree-hours limits and maximum time for fermentation at a given room temperature.



<http://caloriesproper.com/fermented-meat-probiotics/>

# Degree Hours

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Time in F degree- hours above 60° F (16° C)	Chamber temperature		Maximum hours to pH 5.3
	° F	° C	
1200	75	24	80
1200	80	27	60
1200	85	30	48
1000	90	32	33
1000	95	35	28
1000	100	38	25
900	105	41	20
900	110	44	18

Questions????

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# Test Time!



# Resources

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Toldra, F (2007). *Handbook of Fermented Meat and Poultry*. Iowa: Blackwell Publishing. pp.125-129, 32-33.

Canadian Professional Meat Cutters Association. (2009). *Manual of Meat Cutting and Processing*. Thompson River University. Module 12, pp. 12–14, 30-38.

<http://www.inspection.gc.ca/food/meat-and-poultry-products/eng/1300124955992/1300125034322>

[USDA: Processing Inspectors' Calculations Handbook](#)