

Natural Curing for Meats

Niche Meat Processor Assistance Network

Thursday, March 4

10am Pacific/ 1pm Eastern

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UW-MADISON
ANIMAL SCIENCES

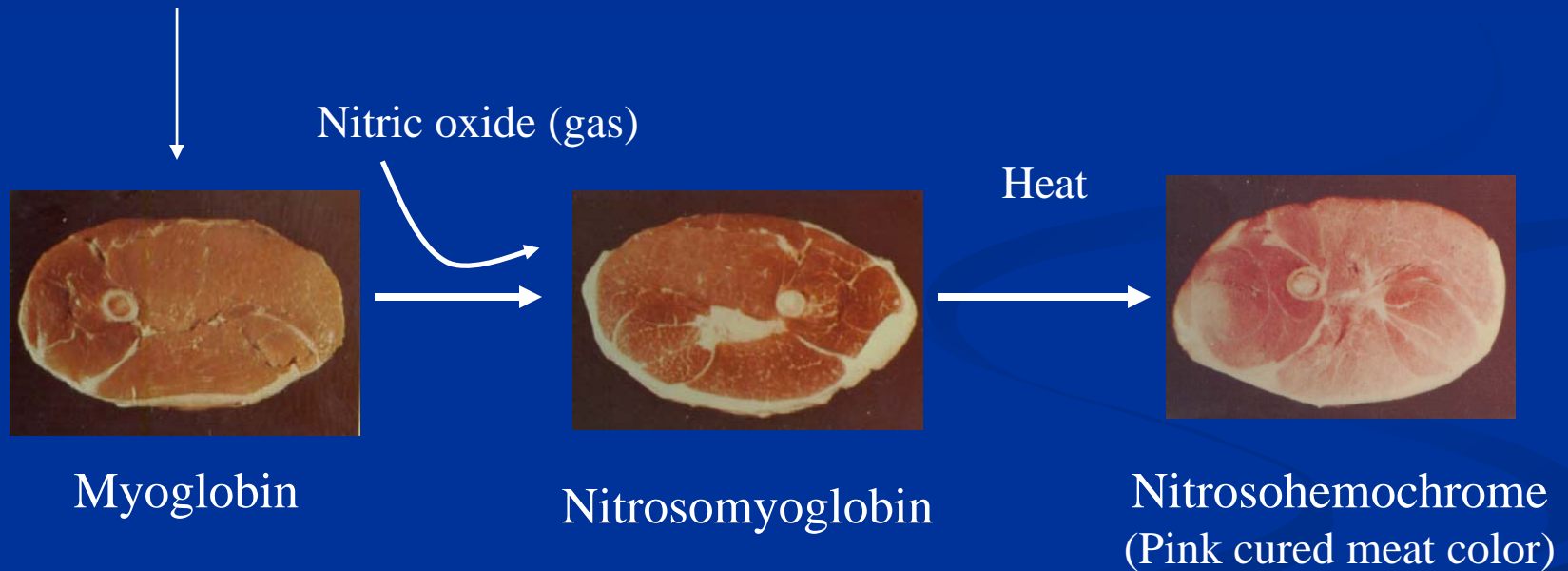
Purpose of Sodium Nitrate / Nitrite

- Cured meat color
- Cured meat flavor
- Preservative properties
 - Growth of *Clostridium botulinum*
- Powerful antioxidant
 - Effective in controlling fat oxidation



Cured Meat Color Development

Addition of sodium nitrite



Natural, Organic and Conventional Labeling Claims

■ Organic

- 100% organic
- Organic
- Made with organic
- Less than 70% organic

■ Natural

■ Uncured

More Restrictive



Less Restrictive

Natural Labeling

- USDA, Food Standards and Labeling Policy Book
- 21 CFR 101.22
 - ‘(1) the product does not contain any artificial flavor or flavoring, coloring ingredient, or chemical preservative (as defined in 21 CFR 101.22), or any other artificial or synthetic ingredient; and (2) the product and its ingredients are not more than minimally processed....’

§ 101.22

(c) Among representations in the labeling of a food which render such food misbranded is any representation that expresses or implies a geographical origin of the food or any ingredient of the food except when such representation is either:

(1) A truthful representation of geographical origin.

(2) A trademark or trade name provided that as applied to the article in question its use is not deceptively misdescriptive. A trademark or trade name composed in whole or in part of geographical words shall not be considered deceptively misdescriptive if it:

(i) Has been so long and exclusively used by a manufacturer or distributor that it is generally understood by the consumer to mean the product of a particular manufacturer or distributor; or
(ii) Is so arbitrary or fanciful that it is not generally understood by the consumer to suggest geographic origin.

(3) A part of the name required by applicable Federal law or regulation.

(4) A name whose market significance is generally understood by the consumer to connote a particular class, kind, type, or style of food rather than to indicate geographical origin.

Subpart B—Specific Food Labeling Requirements

§ 101.22 Foods; labeling of spices, flavorings, colorings and chemical preservatives.

(a)(1) The term *artificial flavor* or *artificial flavoring* means any substance, the function of which is to impart flavor, which is not derived from a spice, fruit or fruit juice, vegetable or vegetable juice, edible yeast, herb, bark, bud, root, leaf or similar plant material, meat, fish, poultry, eggs, dairy products, or fermentation products thereof. Artificial flavor includes the substances listed in §§ 172.515(b) and 182.60 of this chapter except where these are derived from natural sources.

(2) The term *spice* means any aromatic vegetable substance in the whole, broken, or ground form, except for those substances which have been traditionally regarded as foods, such as onions, garlic and celery; whose significant function in food is seasoning rather than nutritional; that is true to

21 CFR Ch. I (4-1-08 Edition)

name; and from which no portion of any volatile oil or other flavoring principle has been removed. Spices include the spices listed in § 182.10 and part 184 of this chapter, such as the following:

Allspice, Anise, Basil, Bay leaves, Caraway seed, Cardamom, Celery seed, Chervil, Cinnamon, Cloves, Coriander, Cummin seed, Dill seed, Fennel seed, Fenugreek, Ginger, Horseradish, Maca, Marjoram, Mustard flour, Nutmeg, Oregano, Paprika, Parsley, Pepper, black; Pepper, white; Pepper, red; Rosemary, Saffron, Sage, Savory, Star anise, Tarragon, Thyme, Turmeric.

Paprika, turmeric, and saffron or other spices which are also colors, shall be declared as “spice and coloring” unless declared by their common or usual name.

(3) The term *natural flavor* or *natural flavoring* means the essential oil, oleoresin, essence or extractive, protein hydrolysate, distillate, or any product of roasting, heating or enzymolysis, which contains the flavoring constituents derived from a spice, fruit or fruit juice, vegetable or vegetable juice, edible yeast, herb, bark, bud, root, leaf or similar plant material, meat, seafood, poultry, eggs, dairy products, or fermentation products thereof, whose significant function in food is flavoring rather than nutritional. Natural flavors include the natural essence or extractives obtained from plants listed in §§ 182.10, 182.20, 182.40, and 182.50 and part 184 of this chapter, and the substances listed in § 172.510 of this chapter.

(4) The term *artificial color* or *artificial coloring* means any “color additive” as defined in § 70.3(f) of this chapter.

(5) The term *chemical preservative* means any chemical that, when added to food, tends to prevent or retard deterioration thereof, but does not include common salt, sugars, vinegars, spices, or oils extracted from spices, substances added to food by direct exposure thereof to wood smoke, or chemicals applied for their insecticidal or herbicidal properties.

(b) A food which is subject to the requirements of section 403(k) of the act shall bear labeling, even though such food is not in package form.

(c) A statement of artificial flavoring, artificial coloring, or chemical preservative shall be placed on the food

Organic Meat and Poultry Products

- National Organic Program (NOP)
 - Agricultural Marketing Service (AMS)
 - www.ams.usda.gov/nop/NOP/standards/ListReg.html

- The National List of Allowed and Prohibited Substances
 - 7 CFR
 - § 205.605 Nonagricultural (nonorganic) substances allowed as ingredients in or on processed products labeled as “organic” or “made with organic (specified ingredients or food group(s)).”
 - § 205.606 Nonorganically produced agricultural products allowed as ingredients in or on processed products labeled as “organic” or “made with organic (specified ingredients or food group(s)).”

USDA Definition of Uncured Meat Products

- Definition found in 9 CFR 317.17 and 9 CFR 319.2
 - Normal cured products that can be made without nitrites or nitrates added
- Statements/words that must be added
 - “Uncured” before common name
 - i.e. Uncured Frankfurters
 - “No Nitrate or Nitrite Added”
 - “Keep Refrigerated Below 40°F At All Times”

“Natural Curing” Systems

- Vegetable juice powders and juices
 - Standardized up to 30,000 ppm nitrate
- Pre-converted vegetable juice powders and juices
 - Standardized up to 10,000 ppm nitrite
- Lactic Acid Starter Cultures
 - *Staphylococcus carnosus*
 - *Staphylococcus carnosus* / *vitulinus*
 - *Staphylococcus carnosus* / *utilis*
- Cherry Powder
 - Ascorbic acid

Natural Sources of Nitrate

■ Vegetable sources of “natural” nitrate (avg. ppm):

■ Radishes	2600	■ Tomatoes	80
■ Celery	3151	■ Potatoes	150
■ Lettuce	2330	■ Turnip Greens	9040
■ Spinach	2470	■ Onions	235
■ Carrots	274	■ Melon	4932
■ Beets	3288	■ Rhubarb	2900
■ Cabbage	712	■ Broccoli	1014
■ Beans	466		

Curing Ingredient Activity

- Sodium/Potassium Nitrate =
INACTIVE COMPOUND
- Sodium/Potassium Nitrite =
ACTIVE COMPOUND

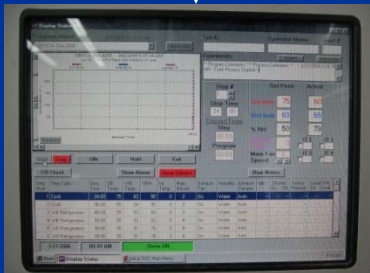


“Natural Curing” Cured Meat Color Development

Addition of nitrate source
and starter culture.

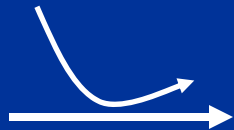


Myoglobin



Incubation reduces
nitrate to nitrite

Nitric oxide (gas)



Nitrosomyoglobin

Heat



Nitrosohemochrome
(Pink cured meat color)

“Naturally Cured” Product Manufacture – Cultured System

Step # 1:

Addition of ingredient containing
naturally occurring nitrates
&
Nitrate reducing starter culture

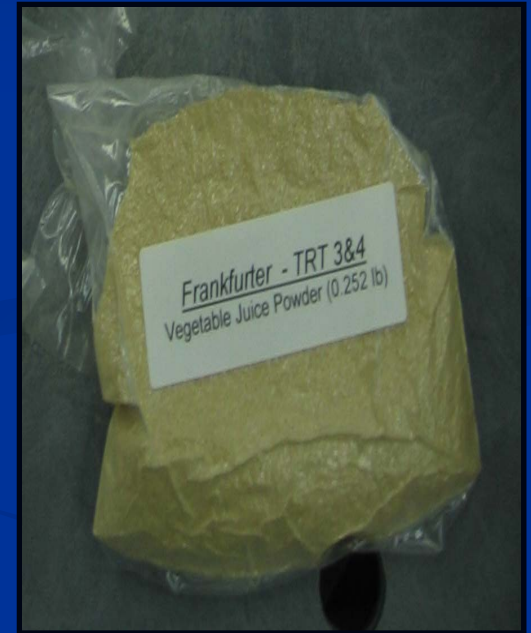
Process Formulation

■ Vegetable juice powder or juice

- Nitrate source
- Can be labeled as “celery powder”, “flavoring” or “natural flavoring”

■ Lactic acid starter culture

- *Staphylococcus carnosus*
- *Staphylococcus carnosus* / *vitulinus*
- *Staphylococcus carnosus* / *utilis*



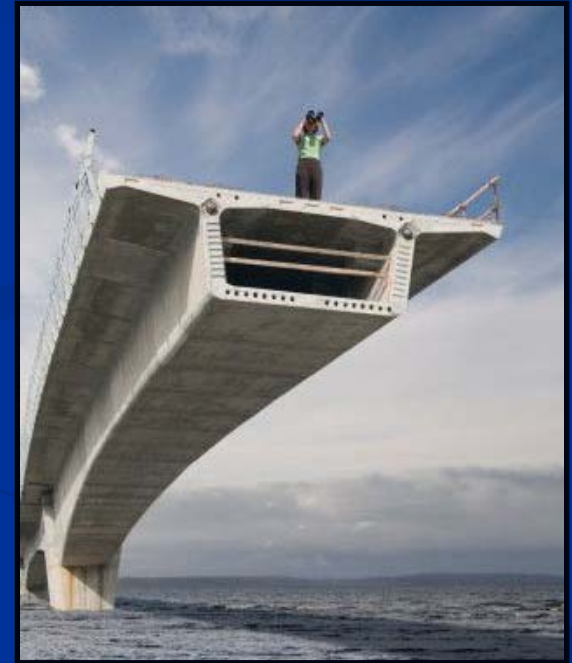
Proper Use of Ingredients

■ Vegetable Juice or Powder

- Goal is to maximize levels
 - Minimum of 0.2%
 - Maximum of 0.4% ...?
 - Depends on amount of spices in product

■ Starter Culture

- Per manufacturer's recommendations
 - 25 g per 225 kg recommended



Step #2:

Incubation - Conversion of
nitrate to nitrite

Requirements for Nitrate Conversion

- Proper incubation of product essential
 - Goal is to convert as much nitrate to nitrite as possible
 - Internal temperature held optimum starter culture function temperatures
 - i.e.: 50-113 °F (86 °F optimum)
 - ~ 1-2 hours
 - Depends on product diameter
 - Frankfurters = 2 hours
 - Ham = 1 hour (or less)
- Optimum time for starter culture function
 - Nitrate reductase enzymes reduce nitrate to nitrite

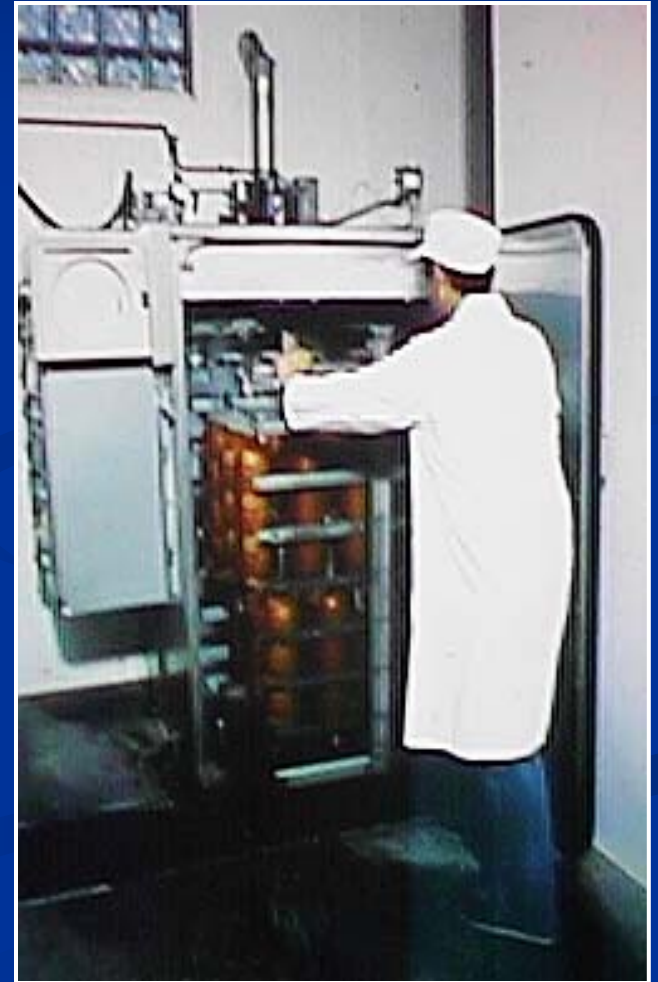


Step #3:

Cooking

Cooking Requirements

- Besides the addition of an incubation step, no other changes are necessary



Uncured Frankfurter Smokehouse Schedule

Step	Step Type	Time	Dry Bulb (°F)	Wet Bulb (°F)	RH (%)
1	Cook	2:00	105	103	93
2	Cook	00:20	140	0	0
3	Smoke Cook	00:30	150	118	38
4	Cook	00:20	160	145	67
5	Cook	IT: 160 F	185	178	85

*** Step 1 is where conversion of nitrate to nitrite will occur.

Uncured Ham Smokehouse Schedule

Step	Step Type	Time	Dry Bulb (°F)	Wet Bulb (°F)	RH (%)
1	Cook	1:00	105	103	93
2	Cook	00:30	160	110	21
3	Cook	00:30	165	115	22
4	Cook	01:00	170	120	24
5	Cook	00:45	170	0	0
6	Cook	00:30	170	150	60
7	Cook	IT: 160 F	180	180	100

*** Step 1 is where conversion of nitrate to nitrite will occur.

Processing Concerns & Challenges

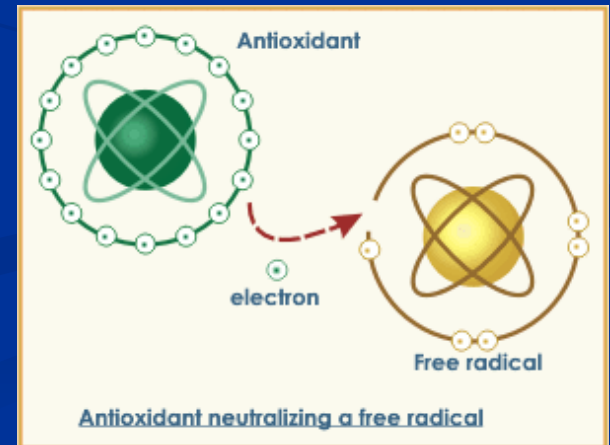
Whole Muscle Processing Requirements

- Starter culture must be injected into whole muscle cuts
 - Not water soluble
 - Will not penetrate meat during tumbling or immersion curing



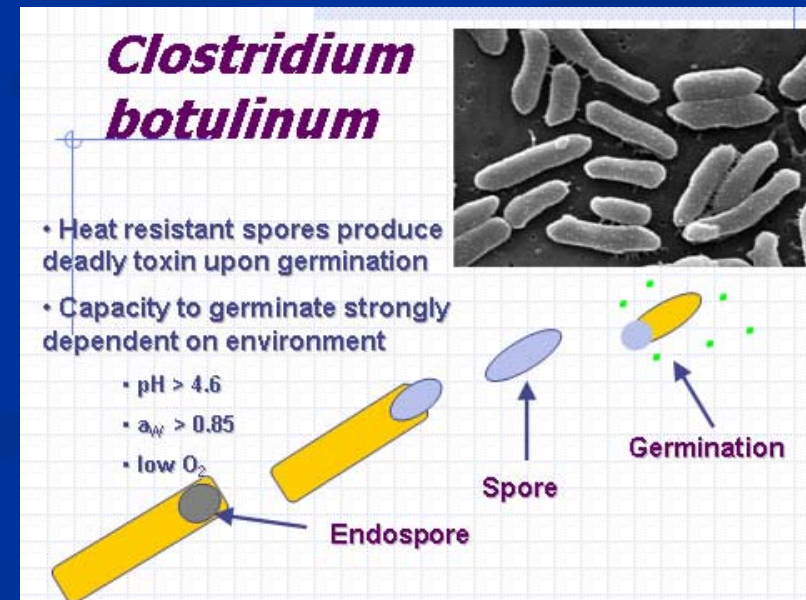
Natural & Organic Quality

- Antioxidant protection
 - ~ 50 ppm nitrite
 - Dependent on amount of unsaturated lipids
- Maintaining cured color
 - 2-14 ppm nitrite induces cured color
 - 40-50 ppm nitrite generally considered adequate
- Antimicrobial protection
 - Quality of raw materials
 - Few ingredients available



Natural & Organic Safety

- Clostridium Botulinum inhibition
 - 50-60 ppm ingoing nitrite?
 - Difficult to assess without challenge studies
 - Difficult to quantify true amount of nitrite generated



Questions?