

CURING

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- Before the advent of refrigeration, curing was the addition of salt to meat for the purpose of preservation.
- Used to produce – pleasant flavor, color and appearance
- Ingredients include NaCl, NaNO₃ and NaNO₂

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Functions of the salts.

- NaCl – Used in all curing formulae, not in high concentration to effect preservation purposes. If used as such the product would be too salty. Used to enhance flavor
- NaNO₃. Used as Sodium or potassium salt. Responsible for the color but it must be reduced to NO₂ by microorganisms

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- NO₂
- Used as Na or K salt. Responsible for the color as it combines with myoglobin to form nitrosomyoglobin

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- With refrigeration, curing achieves unique color, flavor, texture *(in massaged or tumbled products)and palatability
- Curing divided into: Traditional and Rapid cures
- Central principle is to ensure distribution of cure ingredients

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Forms of curing

- Dry cure – Involves rubbing of cure ingredients to the surface. It takes long for curing to occur because of poor diffusion of ingredients and sometimes needs more than one application
- Brine cure – Use of brine containing the curing salts NaCl 20%, NO₂ 0.08% and NO₃ at 0.2%. Brine introduced into meat by artery pumping, Stitch and multineedle injection pumping

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Role of ingredients

- NaCl – flavor and 3-5% w/v gives acceptable flavor.
- NO_3 Serves as source of NO_2 . $\text{HNO}_2 \rightleftharpoons \text{NO} + \text{H}_2\text{O} + \text{HNO}_3$
- NO_2 Reduced to NO and this combines with myoglobin to form nitrosomyoglobin(NOMB), the color of cured meat.

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- 5ppm is required for formation of NOMb. The color is not stable
- 20ppm gives stable NOMb
- Flavor of cured meat increases with concentration of NO. 50-100ppm gives acceptable flavor.
- For protection against poisoning by *Cl. botulinum*, 100ppm are required.

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- Protection is the combined effect of curing salts, pH of emulsion formed and heating to liberate PERIGO factor.
- Traditional Cure (Wiltshire cring)
- Pigs are slaughtered in a humane manner, dressed, chilled at 3-7°C, sides deboned, trimmed off fat and injected with brine which must be freshly made

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- Injection brine NaCl 18-22% target uptake 20%, NaNO_2 0.006-0.10 % target 0.08% and NaNO_3 at 0.15- 0.25 target 0.2%.
- Temp. is controlled between 3-4.5°C to inhibit microbial growth. It is expected the injected sides to take up 8-10% of brine.
- The injected sides are sprinkled with salts, immersed in tank with immersion brine. Temp controlled at 3-4,5°C and pH of brine not to exceed 6.5

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- Immersion brine – NaCl 25-27%, NO₂ 0.08- 0.12% and NO₃ 0.24 – 0.40%. Remain here for 72-120 hrs if hand injected and 48-96 hrs if machine injected.
- The brine concentration and pH are constantly checked and adjusted. pH should be between 6.8-6.9. If pH increases it develops off flavor. Humidity not exceed 85%.
- Microbial count not to exceed 5x10⁵cfu in plate Agar containing 4% Salt.

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- The sides are stacked rind upwards to mature. Temp. 3-4.5°C for 5 days and humidity not above 85%.
- Smoked or not. Stored at -2 – 4°C

Rapid cures

- Differ from traditional cures in i) they use other additives ii). Use mechanical agitation and iii). Use to cure sides and primal cuts and also from older animals

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Mechanical agitation

- May involve massaging or tumbling. Tumbling -imagine movement of cement mixer while massage is similar but takes longer and may rotate in alternate directions
- Whether tumbling or massaging, the effects are: - i). Accelerates brine dispersion in the meat. Agitation causes distortion of muscle fibers allowing free movement of brine

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- li). Improved uniformity of color. With improved dispersion , brine comes into proximity of myoglobin as a result of distortion of sarcolemma
- lii). Improved uniformity of texture. Mechanical agitation has a tenderizing effect
- liv). Improved muscle binding. There is extraction of salts soluble proteins, these coat myofibers and on heating, the proteins coagulate and form stable junctions act as the binding matrix.

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- Successful product depends on: i) adequate disruption of myofibrils. Must have adequate massage or tumbling time. ii). Sufficient solubilization of proteins for adequate binding and iii). Realignment of salt soluble proteins to form the stabilized junctions during cooking.
- Use of other additives. Worthy of mention are ascorbates and phosphates.

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ASCORBATES

- Ascorbic acid and erythroic acids or its Na salts are used in emulsions
- They function as cure accelerators. They reduce formation of nitrosometmyoglobin (NometMb) by increasing formation of NO.
$$3\text{HNO}_3 \rightleftharpoons 2\text{NO} + \text{HNO}_3 + 3\text{H}_2\text{O}$$
. Ascorbates shift the reaction to the right .

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- In the presence of oxygen, NOMb is oxidized to NOmetMb thus causing the color to fade. Ascorbates scavenge for oxygen thus reducing the tendency to oxidize NOMb.
- NO combines readily with primary amines to form nitrosoamines known to be carcinogens. Ascorbates inhibit the nitosylation of amines thus preventing the formation of carcinogenic nitrosoderivatives but they have no effect on dimethylamines.

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- Phenols and tocopherols known antioxidants reduce the formation of volatile nitrosoamines.

Phosphates

- All phosphates are hydrolyzed to ortho form depending on temperature, pH, enzyme catalysts.

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- Phosphates function as:- i) increase meat pH and therefore WHC, ii) increase WHC due to net charge effect,iii). They are metal chelators thus reduce the steric effect and increase WHC and iv). They act as ATP analogues.

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AIM

- Explain the role of mechanical agitation and other added additives in rapid cures