

Preservation 3

CURING

- **Curing may be defined as the addition of salt, sugar and nitrate or nitrite to the meat, which results in conversion of the meat pigments into the characteristic cured meat pigments imparting the characteristic cured meat colour and production of characteristic meat flavour. The process of meat curing is currently valued as a means of imparting organoleptic qualities to the cured products, though it originally was introduced as a means of preserving meat.**
- **After refrigeration techniques came the need for preserving meat by curing alone has reduced.**

- **Curing Ingredients**
 - Sodium chloride
 - Sodium or potassium nitrate or Sodium nitrite
 - Monosodium glutamate
 - Sugar
 - Acetic acid
 - Vinegar and
 - Spices

Action of Curing Ingredients

- **Salt**(15 to 30%)
 - Salt acts by dehydration and alteration of osmotic pressure so that it inhibits bacterial growth and subsequent spoilage.
 - It ionizes to yield the chlorine, which is harmful to the organisms.
 - It interferes with the proteolytic enzyme action.
 - An acceptable level of salts in hams has been reported to be about 3% and about 2% for bacon.
- **Sugar**(1to 4%)
 - Sugar softens the products by counteracting the harsh and hardening effects of salt.
 - It interacts with amino groups of the proteins and upon cooking, forms browning of the products, which enhances the flavour of the cured meats.
 - It acts as a preservative by dehydration.

- **Nitrates and Nitrites** (500 to 1000 ppm)
 - Nitrates and nitrites bring about the desired pink colour development – nitrosyl hemochromes.
 - nitrates act as a reservoir for nitrites.
 - Nitrate raise the oxidation-reduction potential and therefore are more favourable to aerobic than anaerobic organisms.
 - They inhibit the growth of food poisoning and spoilage organisms. effective in preventing the growth of the *Clostridium botulinum* organism.
 - They retard the development of rancidity.
- Nitrate or nitrite alone or in combination of both shall not be more than 200 ppm in finished products as it is toxic
- There are more stringent limits for curing agents in bacon to reduce the formation of nitrosamines. For this reason, Nitrate is no longer permitted in any bacon.

- *Nitrosamine*
 - The reaction of nitrous acid (which is formed by the breakdown of nitrite) with secondary amides produces nitrosamine.
 - nitrosamine are carcinogenic compounds and have been isolated from cured meats in a few instances.
- *Phosphates*(2 to 4%)
 - Alkaline phosphates are used to increase the water binding capacity and thereby the yield of the finished product.
 - Decrease the amount of shrinkage in smoked products when cooked.
 - Approved phosphates are-Sodium tripolyphosphate, Sodium hexa metaphosphate, Sodium acid pyrophosphate, Disodium phosphate
 - Legal limits for added residual phosphates are set at 0.5% in the finished products.

- **Ascorbic Acid/ Ascorbates**(0.2 to 1%)
 - Ascorbates take part in the reduction of metmyoglobin to myoglobin, thereby accelerating the rate of curing hence known as curing accelerator
 - Ascorbates react with nitrites to increase the yield of nitric oxide from nitrous acid.
 - Excess ascorbate acts as antioxidant, thereby stabilising both colour and flavour.
 - The antioxidant properties of ascorbate not only prevent development of rancidity but also prevent fading of colour of sliced meats upon exposure to light.

Liquid smoke- 1 % Flavouring agent

CURING METHODS

DRY CURING

- The *second method* is by using a *brine solution*, in which the *product is immersed* or the brine solution is *injected* in to the products with a *needle*. This is called as PICKLING.
- In ARTERY PUMPING, the *brine is injected in to one of the main arteries*. This technique, being essentially a slow process is not very suitable for high speed high volume production requirements.
- In STITCH CURING, an injection with a single needle, provided with many openings is used to deliver the brine into the meat.
- In MULTIPLE NEEDLE INJECTION a syringe with multiple needles is employed to pump the cure into meat.

Precautions

- The cure room should be maintained at 30 to 40°F.
- At a temperature in excess of 50°F the brine will sour and the product will develop off flavour and sour around the bones.
- Types of meat cured-
 - Curing may be applied to all kinds of meats but It is best applied to those meats with high fat content.
 - lean beef, veal or mutton become dry and unpalatable as a result of pickling process.

- CURING Time –
- The time of curing is also known as the rate of curing, which may be stated as, the rate of diffusion of the curing brine.
- The curing time for ham is 3 days per kg and that for bacon is 7 days per inch thickness of subcutaneous fat.
- The following factors influence the total curing time/rate of curing.
- Type of curing technique
 - Thickness and weight of ham/bacon
 - Strength of curing pickle (degree of salinometer reading)
 - Temperature of the curing room and
 - Temperature of the ham/bacon when cured.

SMOKING

- Smoking is done in addition to [curing](#).
- The cured products are placed in airtight smoke house with heat and smoke simultaneously applied.
- Hard wood logs and saw dusts are used to generate smoke. Smoking process extends for 3 days at a temperature of 85°F (29.5°C).
- Smoking gives the products a characteristic colour and flavour. It retards fat oxidation.
- The reduction of water content as well as the deposition of components has bacteriostatic effects.

PURPOSE OF SMOKING

- Improved shelf life
- Development of desirable organoleptic characteristics such as flavour and colour .
- Protection of fat from oxidation.
- Creation of newer product.
- The smoking process aids in preservation by impregnation of the meats on the surface with chemical preservatives from smoke, by combined action of heat and these preservatives during smoking, and by the drying effect, especially on the surface.
- Smoking and cooking, which are generally carried out together, are also involved in the development of the colour, e.g. cure meat colour, which is stabilized by heating.
- The chief bacteriostatic and bactericidal substance in wood smoke is formaldehyde.

- In addition, a physical barrier is provided by superficial dehydration, coagulation of protein and the absorption of resinous substances.
- The browning or maillard reaction is responsible for the development of characteristic brown colour on the surface of smoked products. It involves the reaction of the free amino groups from proteins or other nitrogenous compounds of meat with the carbonyl of smoke.
- Smoking also is known to have a definite influence on the development of rancidity by virtue of its antioxidant activity.

COMPONENTS OF SMOKE

Phenols

- They act as antioxidant, contribute to the characteristic flavour of the smoked products and have a bacteriostatic effect. About 20 different phenols have been isolated and identified from wood smoke, e.g. P-cresol, guaiacol, methyl guaiacol.

Alcohols and Aldehydes

- Primary, secondary alcohols mainly methanol or wood alcohol may exert a minor bacteriostatic effect. Formaldehyde acts as a bacteriostatic agent.

Organic acids

- They also appear to have only a minor preservative action. Eg. Formic acid, acetic acid, propionic acid, butyric and iso-butyric acids, etc.,

Carbonyls

- A large number of carbonyl compounds contribute to smoke e.g. diacetyl, acetone, propanol, etc.
- Certain carbonyl compounds contribute to smoke flavour and aroma and browning of the product.

Hydrocarbons

- A number of polycyclic hydrocarbons have been isolated from smoked foods, e.g. 4-benzopyrene and diphenanthracene . They do not appear to impart preservative or organoleptic properties.

PRODUCTION OF SMOKE

- To minimize the production of carcinogenic substances, wood combustion temperature of 340°C
- Although combustion temperature of 400°C is desirable for maximum production of phenols, this favours the formation of benzapylene and other polycyclic hydrocarbons.
- Aldehydes and phenols condense to form resins, which represents about 50 % of the smoke components and are believed to provide most of the colour in smoked meats.
- Products must be maintained at an internal temperature of not less than 140°F for a period of 30 minutes.

METHODS OF SMOKING

- **Natural air circulation**

- In this method fire pit designed to use logs, sawdust or combination of both is utilized.
- Opening and closing of dampers help to control volume of air.

- **Air-conditioned smoke house**

- This has largely replaced natural air type smokehouses.
- The air circulation is controlled by fan. This house usually control smoke velocity and regulates humidity.

- **Continuous smoke house**

This comprises a part of the continuous process system and was developed specially for frankfurters production.