SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore – 35

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DEPARTMENT OF FOOD TECHNOLOGY

19FTE402 &
MEAT, FISH AND POULTRY PROCESS TECHNOLOGY

TOPIC - SAUSAGES , HAMBURGERS & MEAT BALLS

Introduction

- Sausages are meat products that are salted & usually seasoned or spiced and are an example of comminuted meet products that are generally recognized as emulsified, stuffed, linked, smoked, and cooked meat products. Based on the product characteristics and processing methods, they are broadly divided into three categories: **fresh sausages, cured sausages and fermented sausages**.
- In all cases meat is communited to reduce meat and fat particle size (grinding, mincing, chopping, or flaking), mixing with ingredients, stuffing into specific casing, linking to obtain specific lengths and finally, packaging. Sausages might be of ground and emulsion type.
- In the ground variety of sausages discrete particles of meat are seen on the other hand, in emulsion type sausages fat is emulsified & stabilized by lean component. Sausages were developed to utilize low- quality meats such as trimmings head, shoulder & by- products of the meat. The processing of sausages is a continuous sequence of steps which are all equally important.

Process Flow Chart

Selection of ingredients

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Grinding

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Mixing

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Chopping and emulsifying

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Stuffing

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Linking or tie

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Hanging

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Smoking

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Cooking

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Showering with chilling

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Peeling or slicing

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Packaging

Selection of Ingredients

Sausage ingredients include:

- Meat - based on consideration of fat/protein; moisture/protein and myoglobin concentration
- Moisture - added as ice at time of chopping in a number of fresh and smoked sausages
- Curing ingredients - salt, sodiuim nitrite and/or nitrate and sugar
- Seasonings - may include spices, such as black peper, paprika, mace and cinamon; herbs that may include thyme and savory; vegetables such as garlic and onion and other substances, such as flavor enhancers
- Fillers and binders - occasionally used to improve color, binding properties, slicing characteristics, altering flavor or reducing costs
- Ascorbic acid - used to improve color in smoked sausages
- Other additives - may include liquid smoke

Grinding

- Meat chunks of variable size and shape with variable fat contents are ground to form uniform cylinders of fat and lean.
- The screw feed in the barrel of the grinder conveys the meat & presses it in to holes of the grinder plate.
- The rotating blade cut the compressed meat and aids in filling the grinder plate holes.

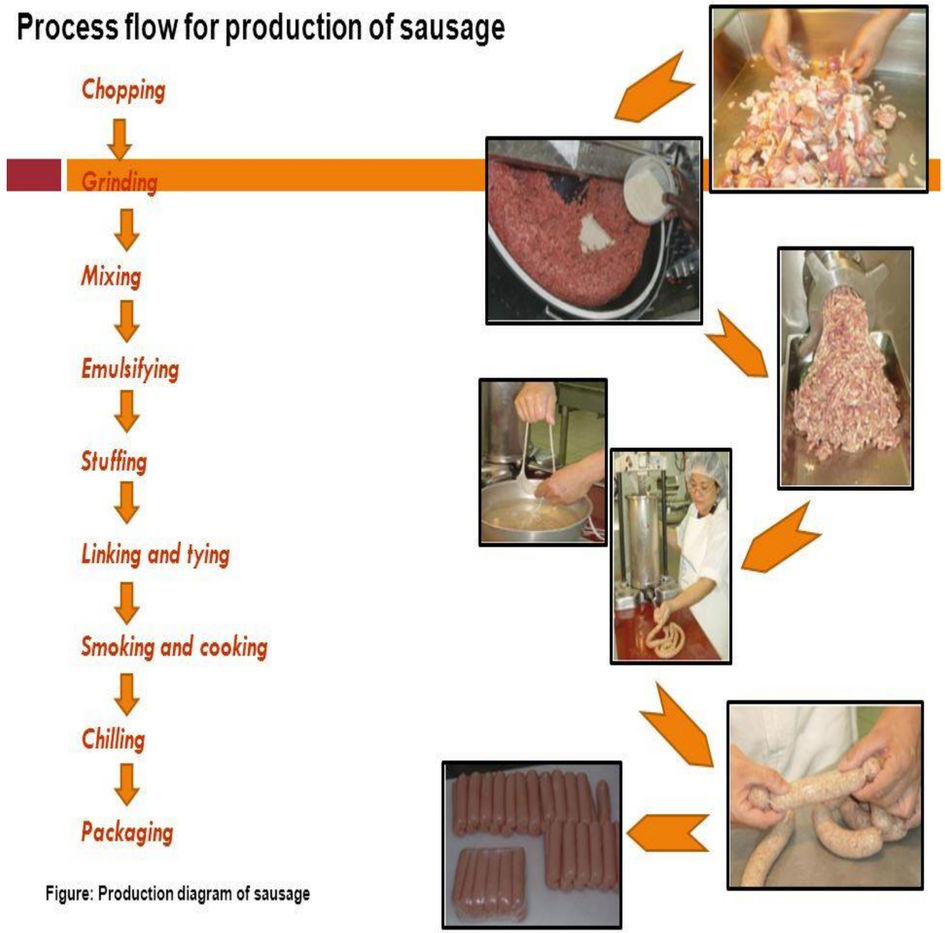

Figure: Production diagram of sausage

Mixing

- Cylinders of fat and lean obtained by grinding are tumbled in a mixer to give a uniform distribution of fat and lean particles.
- This can be used for coarse ground sausages or for emulsion type sausages by utilizing a chopper or emulsifier and with suitable additions of required ingredient to obtain the desired texture & uniformity of composition.

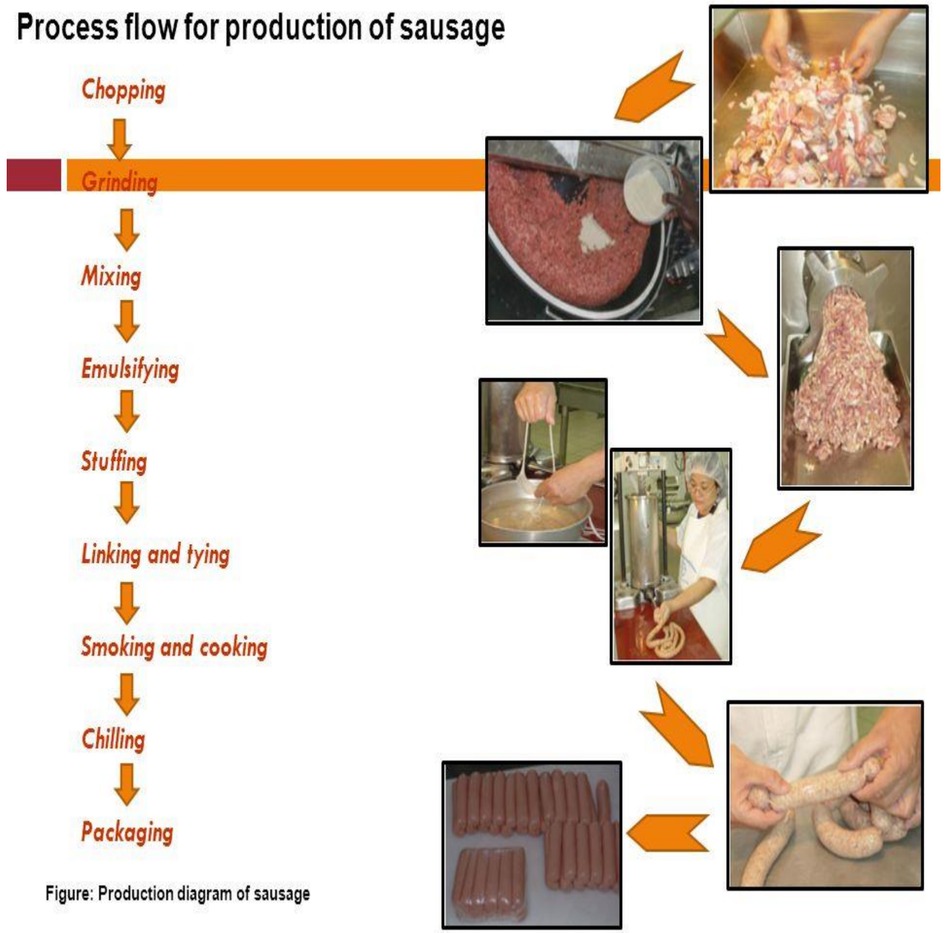

Figure: Production diagram of sausage

Chopping

- It is often used as a means of batching the sausage mix, the mixed batch being transferred to an emulsifier or acquiring the desired texture.

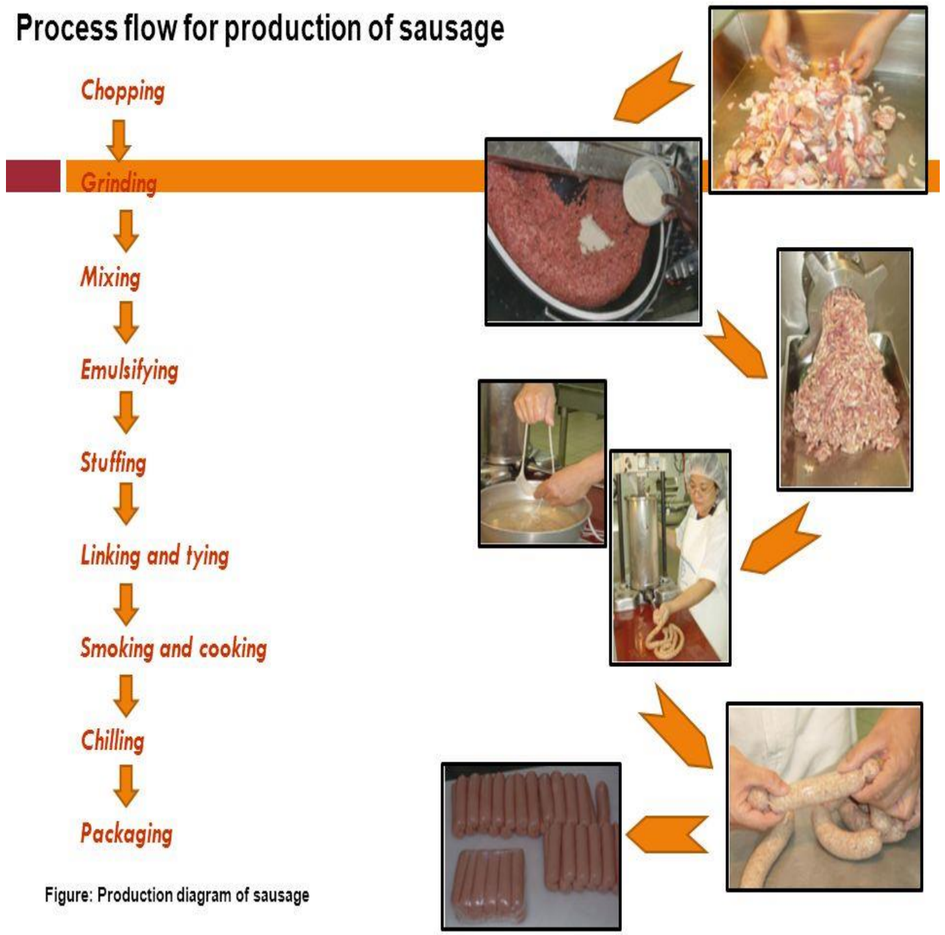

Figure: Production diagram of sausage

Emulsifying

- This machine combines the principle of grinding and chopping. Emulsifier machine handles large volumes of meat rapidly to produce a desired texture.
- Speed of handling material and high degree of disintegration of meat tissue help in obtaining desired textures. In the preparation of sausage, the protein and water of the meat mixture form a matrix than encapsulates the fat portion.
- In a meat emulsion the protein myosin acts as the primary emulsifying agent. The addition of salt to the product is to release the myosin from the muscle fiber.
- The emulsion is generally formed by mixing the meat with salt and other ingredients in a chopper, which aids in disrupting the fibers and facilitates the release of myosin.

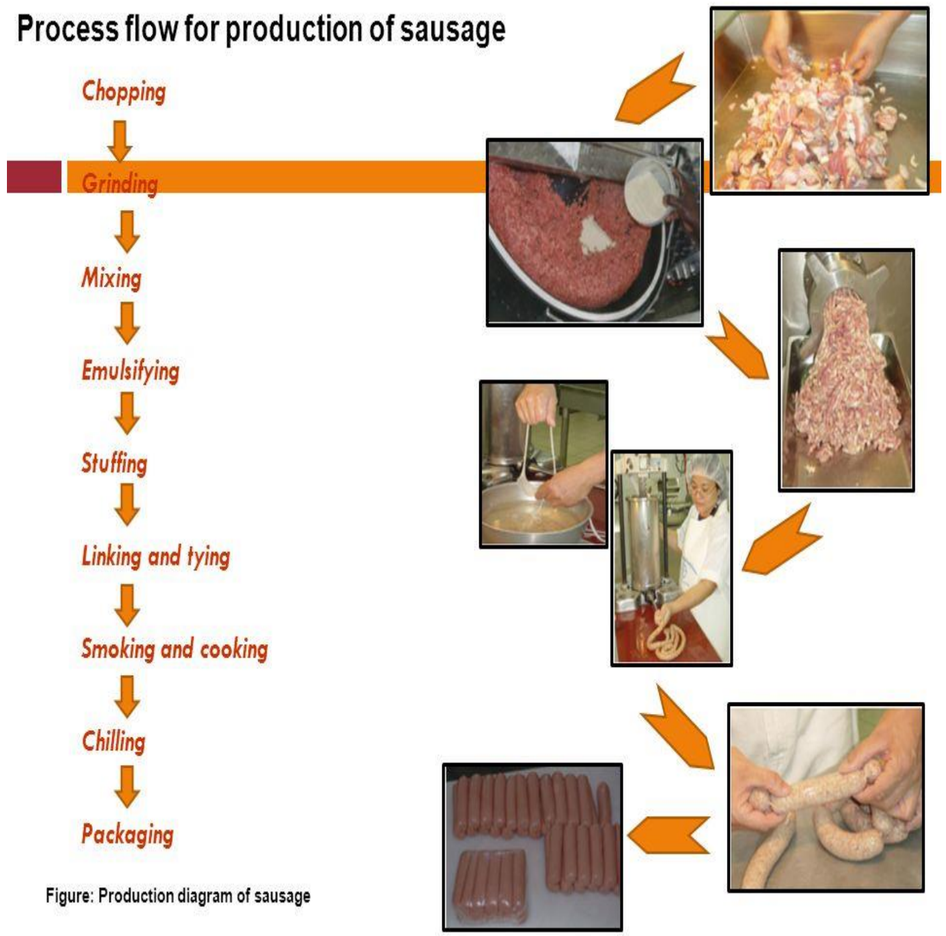

Figure: Production diagram of sausage

Stuffing

- Sausage emulsion also known in the trade as mix sausage dough or batter is transferred to stuffers for extending the mix or emulsion into casings. At this point, the size and shape of the product is determined. Generally three type of stuffing devices are used.

  - Piston
  - Pump
  - Combination of piston & pump

- In the past, the casing of the sausages were made from animal casings, however this was a limiting factor for the production of sausages. Today, the casings are made of cellulosic and regenerated collagen. The limiting factor now, is the supply of meat and the cost of it. Fermented sausages are further subjected for the fermentation and maturation. Fermentation of meat constituents results in flavor development, improvement of shelf life and improved quality and food safety.

Stuffing

- Sausage batter is inoculated with the started bacteria composed of selected lactic acid bacteria (LAB) i.e. homofermentative lactobacilli (Lb pentosus, Lb plantarum, Lb sake, Lb curvatus), pediococci(Pediococcus acidilactici, Pediococcus cerevisiae) and gram positive catalase positive cocci (GCC) i.e. non-pathogenic, coagulase-negative staphylococci (Staphylococcus carnosus, Staphylococcus xylosus, Staphylococcus piscifermentans) . Small manufacturers use spontaneous fermentation without adding starter culture.

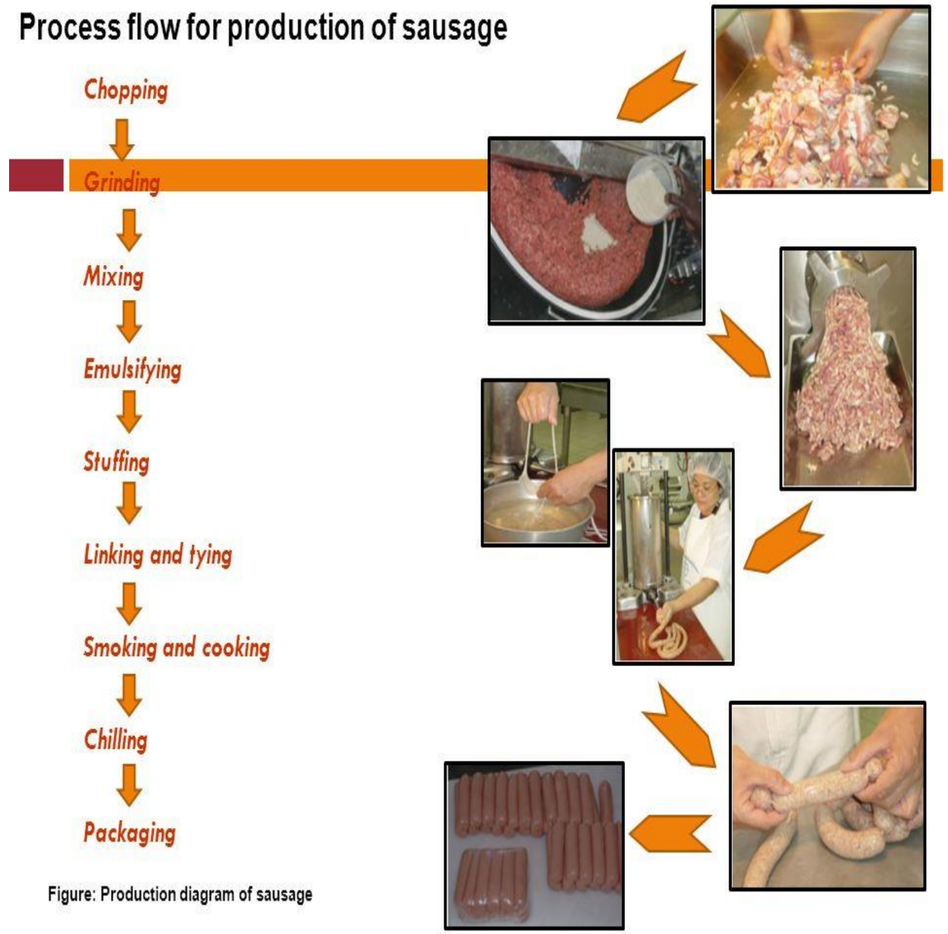

Figure: Production diagram of sausage

Linking and tying

- After the emulsion is stuffed in to casings, the encased mass is tied with thread of fastened with metal clips. In the case of small sausages such as Frankfurters stuffed casing are twisted or drawn together to produces links either by hand or with mechanical devices.
- Large sausages items are tied or slipped on one end with a hanging tie and suspended from a smoke stick or hook so the entire surface is free from contact with the equipment.
- This permits a good flow of air around the sausage in the smoke house and prevents touch marks and spotting due to contact with adjacently hanging product.

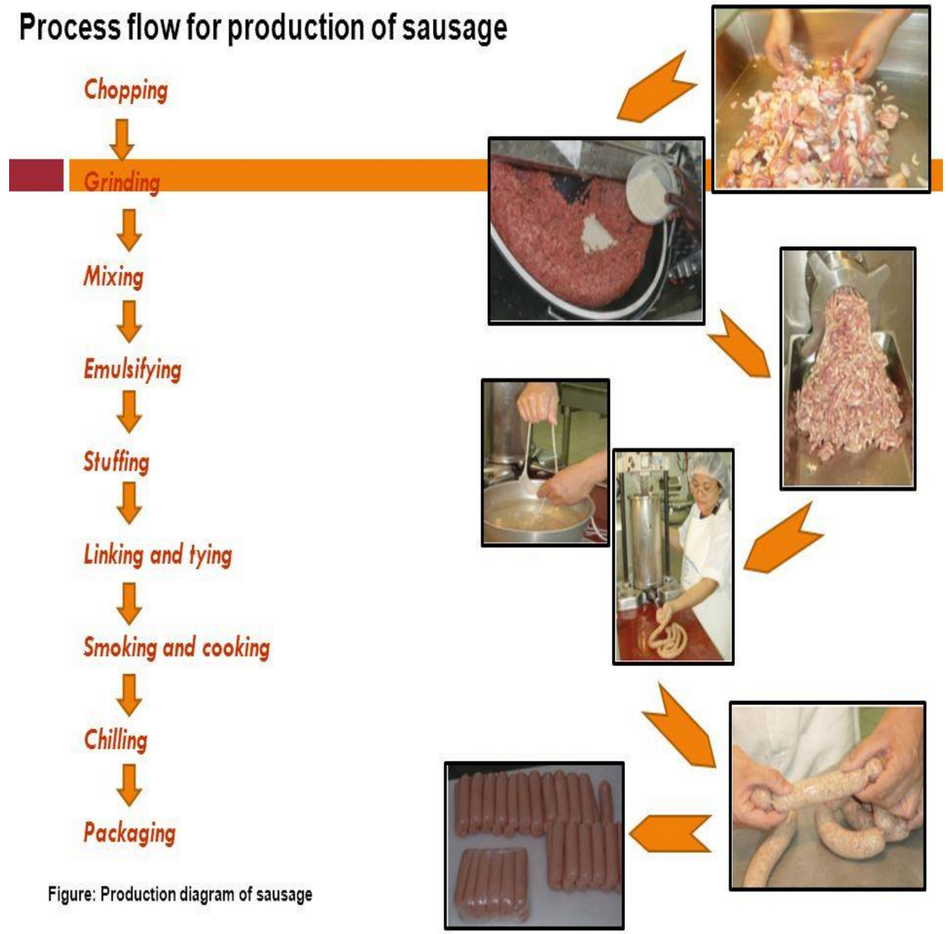

Figure: Production diagram of sausage

Smoking & cooking

- The draped smoker picks are placed on smoke trees or trolleys with 12-18 specs per tree.
- The smoke house operation is essentially a specialized drying and cooking operation in which sausage emulsion is coagulated.
- Encased sausage at the time of introduction in to the smoke house usually has an internal temp of 60-70F. During cooking this rises to 155 to 160F.

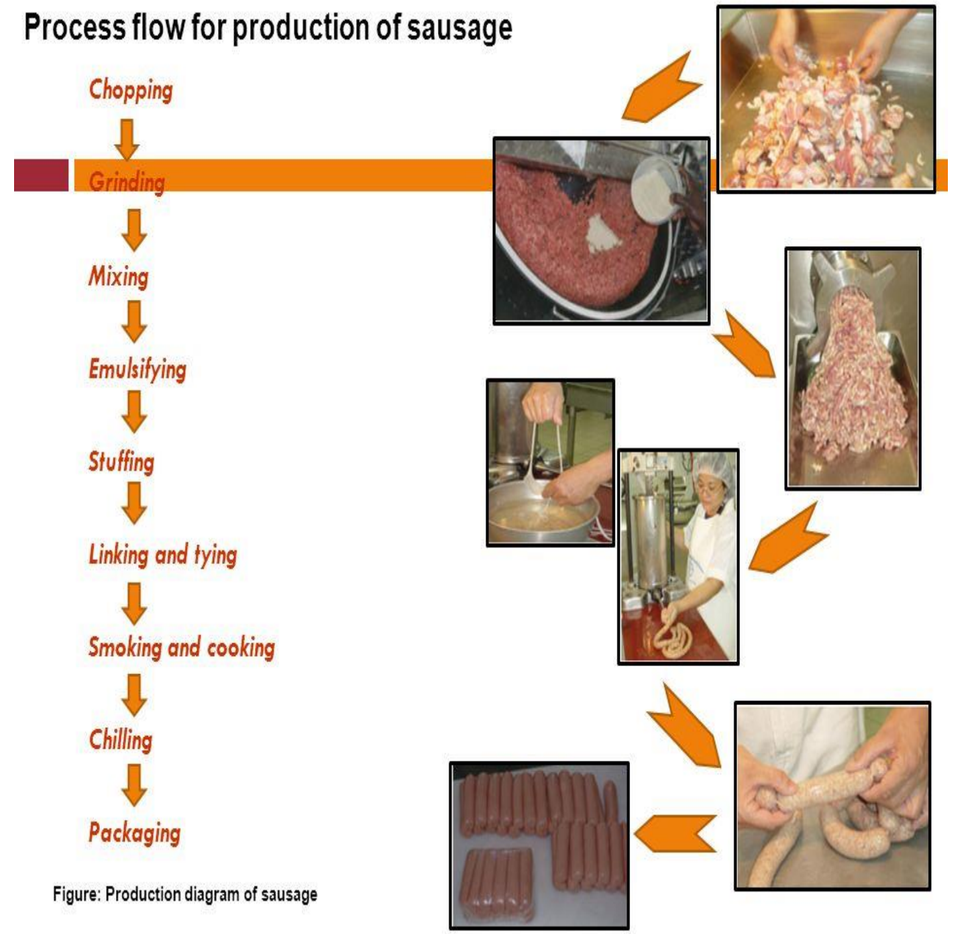

Figure: Production diagram of sausage

Chilling - Peeling & packaging

- After smoking and cooking the product is showered with cold water and than chilled by refrigeration chilling is frequently done with a brine solution by dipping or spraying the products. (a 6% salt brine) balanced within leaching of salt from the sausage and imbibing of water by the sausage.

- After properly chilling the product usually to an ultimate temp of 35 to 40F, the cellulosic casings on frankfurter and slicing bologna are removed. This is known as the peeling operation.

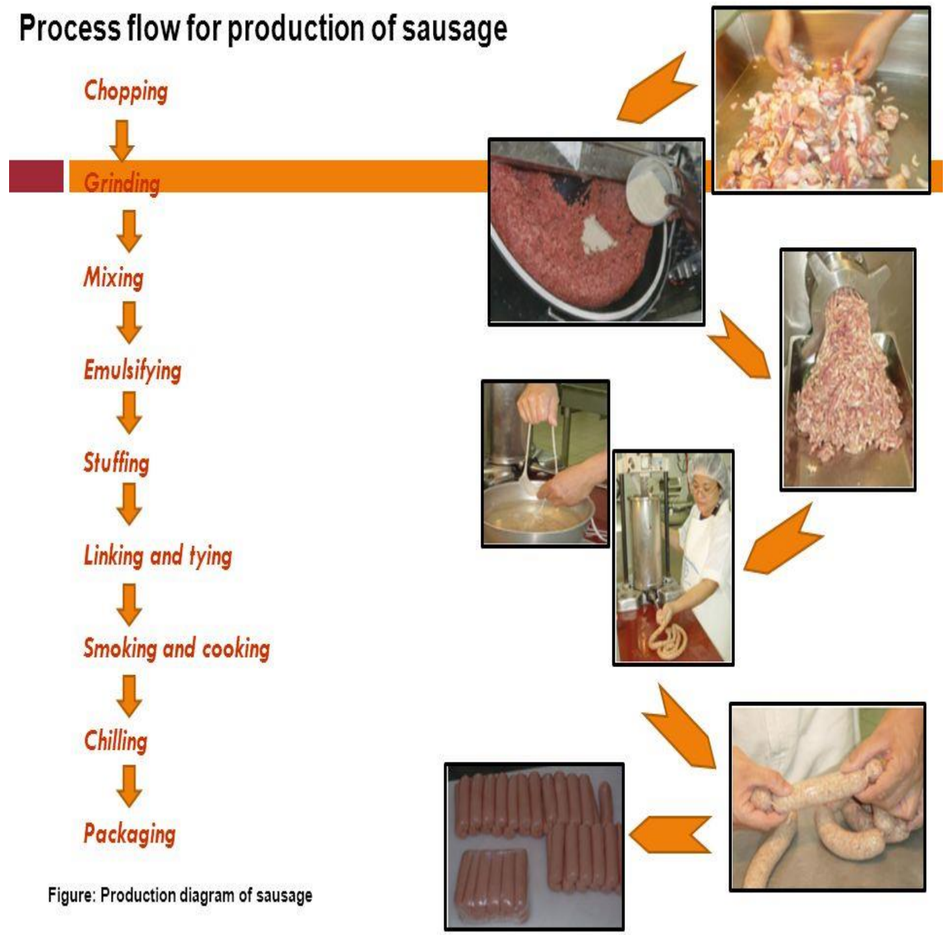

Figure: Production diagram of sausage

Semi dry sausages

- Semi dry sausages are usually made from pork or beef or a mixture of the two and are characterized by a moisture content ranging from 40- 45%, e.g. summer sausage, Gteborg Sausage, Cerevelat, Thuringian, Holsteiner. They have excellent keeping quality with need of little refrigeration because

(1) Some reduction in microbiogical contamination is achieved in the cooking process

(2) A high salt to moisture ratio contributes to retarding bacterial growth

(3) A low pH (5.3 or less) provides the tangy flavor and serves a protective food and good keeping quality is achieved with a pH of 4.8 to 5.0 and with a total acidity of 0.75 to 1% lactic acid.

Grind pork trimmings

↓

Place the trimmings in a mixer; add the salt sugar spices, cure and starter culture and mix for 2 to 3 minute.

↓

Regrind the mix

↓

Hold the mix for 12- 72 hr at 40°F

↓ stuff

Warm water shower for 2 min to wash the sausage surface free of any adhering particles

↓

Smoke the encased sausage for 16 hr at 110°F

↓ Shower with cold water /15 min

Allows to stand at room temp so the surface dies and then chill to 40°F

Dry sausages

- Semi-dried sausages are smoked and cooked to varying degrees, whereas dry sausages are not cooked and only with some products smoke is applied.
- The manufacture of dry sausages is more difficult to control than that of semidried sausages. Overall processing time may require up to 90 days. As a result of this prolonged holding the sausages are vulnerable to chemical, microbiological degradation.
- However, when prepared properly the finished sausages are usually stable and can be held with little or no refrigeration. Examples of dry sausages are Geneva salami, Pepperoni, mortadella etc.

Hamburger

- A hamburger is a processed food like a sandwich or beef sandwich bonded as steak, cooked on the grill or grill, but can also be fried or baked. Outside of speaking is more common to find the name burger. It comes in a light bread halved having a hemispherical shape.

- Often accompanied by onion rings, lettuce, some tomato slice, pickles sheets, etc. They usually dress with some seasoning such as: ketchup, mustard, relish, mayonnaise, etc. In the event that put a sheet of processed cheese becomes a cheeseburger (cheeseburger) Sometimes referred to two: the "yellow burger "(yellowburger).

Hamburger

Beef meat (moisture 74%, fat 10%)

↓

Ground with a meat grinder with 0.3 cm holes

↓

Blended with beef fat (fat 90%, moisture 8%)

↓

Addition of water, TSP (protein 70%, moisture 3%) and spices

↓

Kneaded for 15 minutes by hand

↓

Shaped into hamburger patty of 6 cm diameter and 1.5 cm thickness

↓

Image acquisition from raw hamburger patty

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Cooked in a pan to reach 72°C end-point temperature

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Waited for 5 minutes at room temperature

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Image acquisition from cooked hamburger patty

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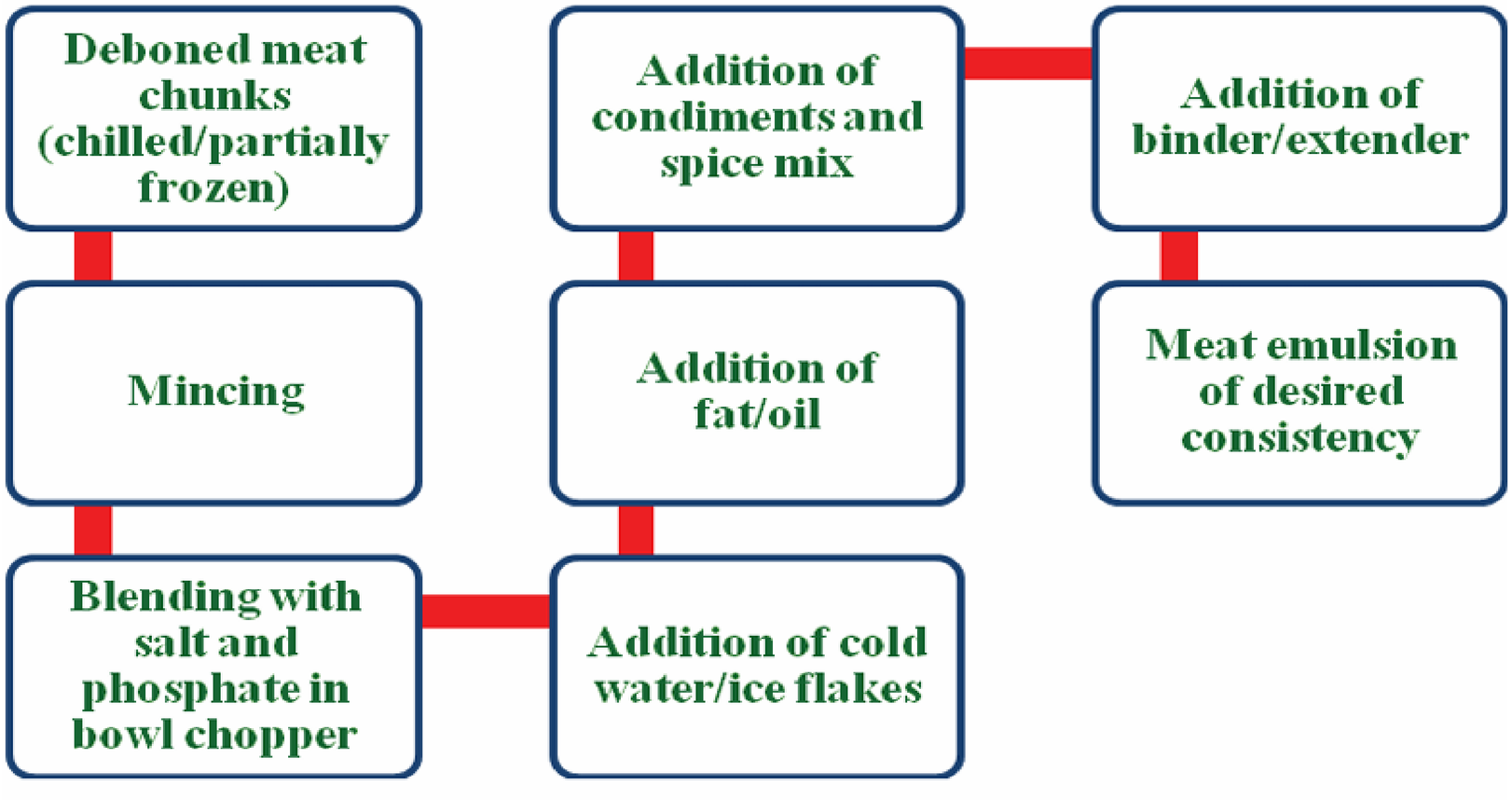
Stored for further analysis

Meat Emulsion



Process flow chart for emulsion preparation

Restructured Meat

Process flow chart for preparation of restructured meat products

Raw materials (Chilled/hot meat)

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Particle size reduction (Chunking/flaking)

↓

Mixing with non-meat ingredients (Massaging/tumbling)

↓

Stuffing

↓

Equilibration (4ºC/12 hrs)

↓

Freezing (-10ºC/24 hrs)

↓

Thawing, Cooking and Slicing

Meat Emulsion

Process flow chart for preparation of restructured meat products

Raw materials (Chilled/hot meat)

↓

Particle size reduction (Chunking/flaking)

↓

Mixing with non-meat ingredients (Massaging/tumbling)

↓

Stuffing

↓

Equilibration (4ºC/12 hrs)

↓

Freezing (-10ºC/24 hrs)

↓

Thawing, Cooking and Slicing

THANK YOU