Glossary

Meat: The term refers all parts of the flesh of healthy dressed carcass, whether beef, pork, veal, lamb or mutton composed mainly of amino acids bound together by peptide bond. Meat consists not only muscular tissue, bone and fat but also includes the edible glands and organs removed at slaughter.

Flesh: Any muscular part from living animal whether edible or inedible is called flesh.

Meat Technology: Meat technology refers to the development of modern techniques for the analysis of meat, meat products and its by-products, its processing and marketing.

Beef: It is a common term of meat of bovine animal of either sex, age, quality etc.

Bullock: A male cattle castrated usually at the onset of puberty.

Carcass: The major portion of a meat animal remaining after slaughter. It varies among animals, but usually the head, the skin, internal organs and the shanks have been removed.

Chevon: The meat of an older, weaned meat goat.

Chilled meat: Meat kept between 0 and 4^{o}C in a chiller or refrigerator usually 24 hours post-slaughter.

Dressing percent: Carcass weight divided by live weight and multiplied by 100. Usually the cold carcass weight is used.

Veal: The meat of young cattle of either sex ranging liveweight from 40-90 kg.

Opportunities and Constraints of Meat Industry

The following are some of the important opportunities and challenges/constraints influencing the meat industry.

Opportunities

- High and increasing demand..
- High livestock population and diverse genotypes.
- Diverse agro-ecologies.
- The expansion of agro-industries and the increase of by-product feeds.

Constraints/challenges

- Inadequate research and extension programs in the production, processing and marketing of meat.
- Inadequate knowledge and technologies to make optimal use of local animal feed resources in diets.
- Livestock diseases and inadequate veterinary support services.
- Inadequate application of HACCP (Hazard Analysis and Critical Control Point) procedures.
- Lack of constant and uniform animal supply.
- Inadequate infrastructures on transportation routes and markets.
- Lack of marketing information and cooperative systems for the marketing of animals.
- Lack of a grading system to provide incentives to producers and to assist in the development of meat exports. In most markets, there are no weighing facilities, and animals are subjectively sold according to appearance and size.
- Inadequate knowledge at different levels of stakeholders (producers, dealers, meat handlers, consumers, etc).
- Lack of an integral connection between the stakeholders involved in the production chain.
- Lack of efficient air transport for export of fresh and chilled meat.
- Some markets are also dominated by influential personalities.

Nutritive value of meat and meat products

Meat and meat products are rich and concentrated sources of nutrients including fats, proteins, vitamin B12, zinc and iron.

Meat is categorised into red meat and white meat. Meat from any source is of similar nutritional value, whether it is white or red. The intensity of colour in meat depends on the amount of myoglobin it contains. It is incorrect to assume that white meat from birds is superior to red meat, or vice versa. Offal meat (i.e. internal organs such as liver and kidney), however, tends to have a higher nutritional value, and red meat is known to contain a rich source of iron.

Red meat

Red or dark meat is mainly made up of muscles with slow fibres. These muscles are used for extended periods of activity, such as standing or walking, and need a steady energy source. Red meat refers to the muscle meat from cattle, sheep, goat and kangaroo and essentially provides considerable amounts of zinc and vitamin B12.

The pigment that is primarily responsible for the red colour of meat is myoglobin, a protein that can bind and store oxygen in cells. The amount of myoglobin in meat varies according to species, age of animal, amount of exercise, stress, condition of storage, exposure to oxygen, heat and processing.

Tissues and organs that require more oxygen for their functions have more myoglobin, and therefore are redder in colour. Beef is shown to contain more myoglobin in its tissue than lamb and pork.

Myoglobin levels also vary depending on muscle use. More active parts of an animal require more oxygen and will therefore have more myoglobin and consequently, be redder or darker in colour. For example, chicken legs are darker than chicken breasts because their legs are more active.

White meat

White meat is made up of muscles with fast fibres. Fast fibre muscles are used for quick bursts of activity, such as fleeing from danger. These muscles source their energy from glycogen, which is also stored in the muscles. White meat is a valuable source of iron and zinc, however, the mineral content per unit weight of white meat is about half the mineral content of red meat per unit weight. Similarly, vitamin B12 content is less in white meat.

Myoglobin content is low in white meat. This explains why chicken breast, pork and veal are slightly pink or white.

Slaughtering and processing of cattle

The basic slaughtering procedure for beef cattle has become more automated and efficient over the past few decades. Most improvements have occurred in stunning, hide removal, evisceration and splitting techniques. The basic process for the slaughtering and processing of cattle is shown in Figure.

Pre-handling of cattle

Cattle are delivered to the abattoir in trucks and unloaded into holding pens, where they are rested for one or two days before slaughter.

Stunning and bleeding
The cattle are led to the slaughter area where they are stunned using a bolt pistol or electric shock. They are then shackled by a hind leg and hoisted onto an overhead rail or dressing trolley. Bleeding, or sticking, then takes place, with the blood collected in a trough for disposal or for further processing.

Dressing and hide Removal
The bled carcasses are conveyed to the slaughter hall where dressing and evisceration take place. The first stage of this process, dressing, can be performed as the carcass hangs from the overhead rail, or the animal can be unshackled and laid in a cradle. The head and hoofs are removed, the head is cleaned with water, and the tongue and brain are recovered. Hides are then removed and conveyed to the hide processing area, where they are preserved by salting or chilled on ice.

Evisceration
The carcasses are then opened to remove the viscera. The stomach (paunch) and intestines are emptied of manure and cleaned in preparation for further processing. Edible offal (tongue, lungs, heart and liver) is separated, washed and chilled. The carcasses are then split, rinsed and then conveyed to a cold storage area for rapid chilling.

Cutting and boning
Carcass cutting and boning often take place after chilling, since a carcass is easier to handle and cut when it is chilled. Boning is the term used to describe the process of cutting meat away from the bone. Recent developments in processing technology have made it possible to undertake boning while the carcass is still warm, eliminating the need to chill the carcass at this stage in the process. This is referred to as ‘hot boning’.

Inspection
Carcasses and viscera are inspected to determine if they are suitable for human consumption. Each carcass and its components are identified and kept together wherever possible until inspection is complete.

By-products
At various stages in the process, inedible by-products such as bone, fat, heads, hair and condemned offal are generated. These materials are sent to a rendering plant either on site or off site for rendering into feed materials.

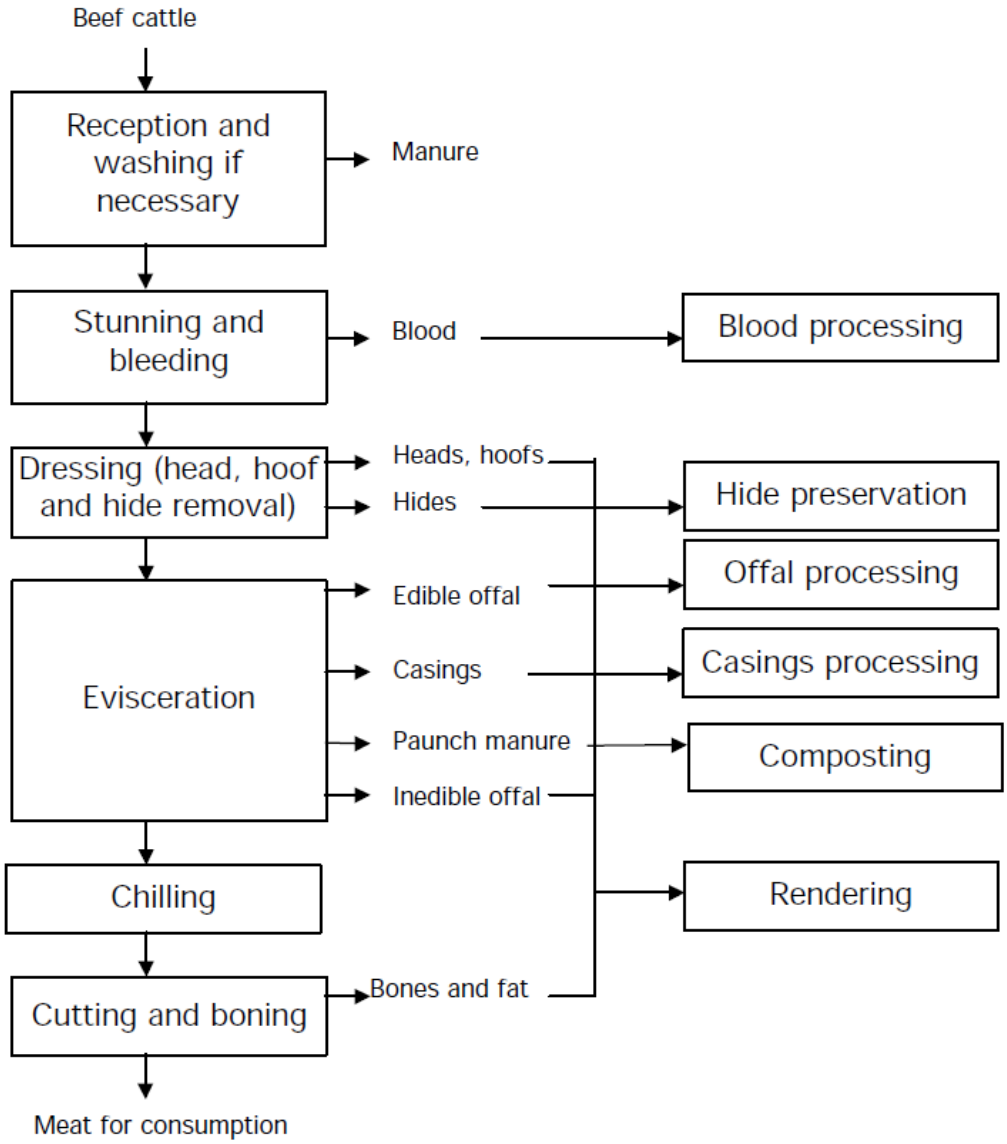

Figure: Flow diagram for slaughtering of cattle

Grading of meat

There is lot of variation in the carcass conformation, size and meat quality depending on the breed, age group, body conformation and health status of meat animals. Meat grading refers to the sorting or grouping of meat carcasses and cuts on the basis of their conformation, finish and overall quality. Although this concept is yet to develop in our country, it is beneficial to the animal raiser at the farm, processor at the packing plant, purchaser at the retail outlet and above all to the quality conscious consumers. Carcass conformation, trimming, meat to bone ratio, colour etc. play an important role in grading. Carcasses of buffalo, goat, sheep or calf may be graded for meat quality as **prime, choice, good or poor**. Pork carcasses are generally graded on the basis of yield in most of the developed countries.

Grading of meat carcasses and wholesale cuts is still confined in India at the export points, that too as per the agreement between the exporter and importer. Directorate of Marketing and Inspection, Government of India has already evolved its grades but the same are still to be implemented.

Dressing of Poultry

Slaughtering:

Slaughtering involves stunning and bleeding:

i. **Stunning**: Stunning prevents struggling and relaxes the muscles holding the feathers. However, it is generally not practiced in case for chicken. A low voltage electric stunning of 50 volts AC for 1 m has been found to be satisfactory .

ii. **Bleeding**: This process is carried out in an inverted cone shaped equipment to rest the body of the bird and keep the head out and down. There are several techniques of slaughtering poultry in order to seek proper bleeding. The technique most commonly used these days is “modified Kosher Method” in which jugular vein is severed just below the jowl taking care not to cut trachea and oesophagus. Another technique for slaughtering the birds is decapitation which is not so common. Still another method which involves piercing knife through the brain has become obsolete. In general, a bleeding retards the keeping quality of dressed chicken.

Scalding

Scalding refers to immersion of birds in hot water for loosening the feathers. It should be done when all reflexes have ceased. The birds are transferred into the scalding tank. Broiler and young birds are scalded at 550C for 1.5 minutes whereas culled birds and spent hens are scalded at 600C for 2 minutes

Defeathering

The process is carried out in a feather plucker consisting of two drums with rubber fingers which revolve in opposite directions pulling of feathers from the carcass. Any remaining feathers are picked up manually.

Singeing

The carcasses are now singed over a blue flame for 5 to 10 seconds to remove hair like appendages called filo plumes.

Washing

The singed carcasses are washed with spray water to remove dirt and reduce the microbial load.

Removal of feet and oil Gland

The next step involves cutting of feet from tarsometatarsal joint with a sharp knife and removal of oil gland.

Evisceration

The carcasses are hung by hocks to the shackles for evisceration. By a slit opening from the tip of breast bone, abdominal cavity is opened by means of a transverse cut. A circular cut is made around the vent. The viscera is drawn outside but allowed to remain attached to the carcass for postmortem inspection. Meanwhile, a slit is made in the skin of the neck for easy removal of crop and neck. After postmortem inspection, inedible offals, including trachea, lungs, oesophagus, crop, intestines, gall bladder and kidneys are removed whereas giblet consisting of heart, liver and gizzard should be collected, cleaned and packed in a wrapper.

Chilling and Draining

After washing, the dressed birds are chilled in a chilling tank containing slush ice or crushed ice for 30-45 minutes in order to cool the carcasses to an internal temperature of about 40C. The chilled birds are kept on the draining rack for 10 minutes to remove the excess water.

Washing

Dressed birds are thoroughly washed again with clean spray water preferably maintained at 15 ± 5^{0}C. Special care should be taken to wash the interior and sides.

Grading

Dressed chickens are graded on the basis of conformation, degree of fleshing, bruises, cuts and other quality attributes.

Packaging

Before packaging, dressed chickens having gizzard without mucosal layer, heart without pericardium and liver without gall bladder are placed in the abdominal cavity of the carcass and packed in polyethylene bags (200 gauge). Shrink packaging may be adopted if dressed chickens are to be stored in a frozen condition.

Storage

Dressed chicken can be stored in a refrigerator at 2^0C for 7 days and deep freezer at -18 to -20^0C for a period of 4-6 months.

Value Added Popular Meat Products

i. Luncheon meat
ii. Meat patties
iii. Meat loaves
iv. Meat balls
v. Meat nuggets.

Processing of Some Convenience Poultry Products

- Tandoori Chicken
- Chicken Barbecue
- Chicken Seekh and Shami Kababs
- Chicken Kofta
- Poultry Pickle
- Chicken Samosa
- Chicken Sausage
- Chicken Patties
- Chicken Tikka