

Humane Slaughter of Food Animals

This is also known as scientific slaughter. Such a slaughter avoids unnecessary pain and cruelty to food animals and ensures as complete bleeding as possible. It also ensures speed of operation and safety of the personnel.

Stunning is a process employed to create a state of immobility or unconsciousness at the time of slaughter. Immediately, the animal is hoisted and blood vessels on the neck are severed (sticking) to bleed the animal to death. It is important to note that in stunning the animal is not killed but only made unconscious.

Stunning Techniques and Devices

They fall into three main categories:

1. ***Mechanical instruments.*** Instruments such as *captive bolt pistol*, *percussion or stunner* cause damage to the brain so the animal immediately loses consciousness. Application point of captive bolt pistol differs with species. In effective stunning, the animal immediately collapses followed by tonic spasms and then movements of the hind legs.
2. ***Electrical stunning.*** It is conveniently employed in stunning of small ruminants, pigs and poultry. The instrument carries electrodes by which alternating current is passed through the brain. Bleeding is very efficient and the power consumption is extremely low. If the current remains low, *missed shock* may occur resulting in paralysis of the animal, although it remains fully conscious. It affects the quality of meat besides compromising the safety of the handler. On the other hand, too high a current may cause *splash*. It refers to the appearance of petechial haemorrhages throughout the subcutaneous tissue in pigs. The capillaries get ruptured due to excessive increase in blood pressure. Signs of efficient electrical stunning include (a) hind-legs stretched out violently (b) fore legs stiff (c) head and neck bent backward (d) cessation of respiration.

Advantages of this system include the following:

- (i) saves manual labour and permits speedy operation

- (ii) humane because unconsciousness is immediately produced and the electrode is painless on application
- (iii) no mutilation of any part of the animal, hence may be acceptable by certain religions.

Disadvantages include:

- (i) blood splashing may occur
- (ii) needs steady electricity

Chemical stunning. Carbon dioxide gas stunning is most suitable for pigs. Carbon dioxide is heavier than air and can be contained in a tunnel. The gas blocks the nerve endings. On exposure to gas, pigs become anaesthetised that are then shackled and bled.

Advantages of this method include:

- (i) Bleeding is quite efficient since carbon dioxide stimulates respiration favouring blood circulation
- (ii) There is no splashing because blood pressure is not increased.
- (iii) Less dangerous than electrical and mechanical methods.

Disadvantages of this method include:

- (i) the system is not fast and requires a lot of space.
- (ii) animals have different sensitivity to carbon dioxide

Slaughter without previous stunning

These include Jewish slaughter and Moslem (Halal) slaughters. These methods employ one stroke to cut the throat, severing altogether the trachea, oesophagus, blood vessels and muscle except the cervical vertebrae and the vertebral artery and spinal cord within it.

Advantages

1. Proponents of the method claim that unconsciousness is attained immediately upon severing of the carotid arteries, hence the method is humane.
2. Since breathing and heart action are not markedly reduced, bleeding is thought to be enhanced.

Disadvantages

1. Unconsciousness may be immediate because of the possible supply of blood to the brain through the vertebral – condyloid anastomoses which remains intact. This circulation may be aided by the blocking of the proximal ends of the severed carotid artery.
2. Stomach contents may be regurgitated and contaminate the tissues of the neck or aspirated to the lungs and mixed with the blood.

Sticking or Bleeding of the Animal

It is important that bleeding should be done as soon as possible after stunning so as to minimise the extravasation of blood into the organs and musculature. Blood pressure is markedly increased during the period of stunning and unless the pressure is relieved immediately by bleeding the rush of the blood to the tissues (splashing) occurs. Bleeding can be done by any of the two methods:

1. After hoisting on the overhead rail, carotid arteries and jugular veins of both sides are severed across the throat region, caudal to the larynx.
2. On the floor, skin is incised along the jugular furrow and carotid artery and jugular vein of one side are severed. The knife is then passed to the chest severing the anterior aorta and anterior venacava.

Sometimes, knife reaches too far in the chest puncturing the pleura and the blood may be aspirated into the thoracic cavity. This blood adheres to the parietal pleura especially the posterior edges of the ribs. This contamination of lungs is called *back bleeding or over-sticking*. It requires to be washed immediately

Dressing of Slaughter Animal

Dressing techniques and sequence of dressing operations vary from place to place and are very much influenced by the equipment and facilities available in the abattoir. The present trend in organized abattoirs is towards line dressing whereby once the animal has been hoisted to the bleeding rail, it is not lowered to the floor till the entire dressing operation is completed. The carcass is conveyed by gravity or power driven along an overhead rail. Equipment such as brisket saw, hock cutter, hide puller, bone cutter etc. facilitate the dressing.

The process includes the opening of the carcass, flaying, evisceration, splitting, inspection and despatch.

1. *Flaying*: This is the removal of the hide and skin of cattle (buffalo), sheep and goat.
2. *Dehairing*: The removal of hair and bristles of pigs. This can be done by hand or by dehairing machine. Plucking or Defeathering is the removal of feathers of poultry. This can be done by 2 methods (a) Dry method whereby the feathers are plucked after destroying the nerve centre behind the brain with a knife. (b) Wet method: here, scalding tank with water is heated to 130⁰F is used to loosen the feather and facilitate plucking.
3. *Evisceration*: Removal of the viscera from the carcass.

Dressing of Cattle

1. After stunning, the animal is hoisted by one leg to the overhead rail. It is brought above bleeding trough or gully and an incision is made just in front of sternum cutting the main blood vessels.
2. Bleeding is done into a specially built bleeding trough which carries the blood into a blood-collecting tank. Complete bleeding is essential as blood is an excellent medium for multiplication of bacteria throughout the carcass.
3. A cut is made across the larynx, the oesophagus is tied off and the head is skinned and detached at the atlas joint.
4. Now the forelegs (shanks) are removed.
5. The hind legs are skinned and removed while the carcass is hung by tendons on the spreader.
6. Deskinning (flaying) is carried forward from hind and forequarters and hide is now pulled with the help of a hide puller.
7. Brisket is now opened along with the midline and the pelvic cavity is opened along the abdominal cavity. Evisceration commences and pluck as well as viscera are removed. A careful cut releases the viscera which are separated into "thoracic viscera": lungs, heart, liver, spleen and the pouch which includes stomach and intestines. The thoracic viscera are hung on hooks over the viscera inspection table

- or on special edible offal carries attached to overhead rails. This is done without delay. The intestinal contents should not be allowed to spill over the carcass and the floor of the slaughter hall. The testicles, penis and tail should be removed and not allowed to contaminate the carcass. The mammary gland should also be removed without it being punctured.
8. Now the carcass is sawn into two halves along the vertebral column.
 9. Spray washing of the carcass. The carcass is then inspected and from the inspection line the carcass is transferred to the chilling room.

Dressing of Sheep and Goat

1. Every effort should be made to ensure that dirt is not carried on the hair/wool into the slaughter place.
2. After stunning, the animal is hoisted to overhead rail and an incision is given in the jugular furrow near the head severing both carotid arteries.
3. The forelegs are knuckled and a cut is made to the front, the forelegs are removed at knee.
4. The neck and cheeks are skinned along with the shoulder. The throat is opened up and oesophagus is tied.
5. The hind legs are knuckled and a cut is made to the root of the tail. The legs are skinned.
6. The skin is incised in the middle of the bell and skinning proceeds towards the flank. Now skin is pulled down over the backbone and base of the head.
7. The head and hind legs are removed. Treatment and the use of the head depend on different customs in various countries.
8. A small cut in the abdomen is extended to the brisket and the breast bone is also split.
9. The pluck and viscera are removed. Kidney and its fat are left in the carcass. Under conditions where a sheep/goat gantry hoist does not exist, all processes should be carried out on a skinning cradle.

10. Spray washing of the carcass is done followed by transfer to the chilling room.

Dressing of Pig

1. Sticking (Killing). After stunning, the pig is hoisted to the overhead rail. An incision of 5 to 10cm is made at the mid-point of neck facing breast bone. The knife is inserted in this incision at an angle of 45° and is forced down and back at least 12 – 15 cm to a point below the front of the breast bone. The knife is given a slight twist before it is withdrawn. Care should be taken not to insert the knife into the chest cavity.
2. Bleeding.
3. Scalding; the animal is dropped in the scalding tank maintained at a temperature of $60 - 62^{\circ}\text{C}$ for about 6 minutes.
4. Scrapping or Dehairing. Raise the animals on the overhead rail and pull off the dew claws and toes while hot. Scrap the loosened hair with the help of a hog scrapper or dull knife hindquarter downwards. Then rinse the carcass with warm water.
5. Singeing. It is done with the help of a blow lamp in which a high temperature is achieved and all the remaining hair is burnt. Besides, singeing sterilizes the cuticle and firms up rind giving it a better appearance and keeping quality.
6. Removal of head. Done at atlas joint before the carcass is opened.
7. Evisceration. Viscera is removed and examined.
8. Splitting of the carcass
9. Final inspection of head and carcass.
10. Spray washing of carcass and transfer to the chilling room.

Post abattoir Handling of Meat

Transportation of meat from the slaughter place to the butchers' shop

The aim of hygienic procurement, slaughter and dressing is to ensure that inspected meat derived from healthy, properly slaughtered animals reaches the consumer clean, unspoiled and in a wholesome state, free from danger of infection or intoxication.

Great care should be exercised in the method used for transporting meat from the place of slaughter to the place of sale. Unhygienic transport, exposing the meat to heat, dust and bacterial contamination can nullify all the measures taken at the most hygienic slaughter facility

and properly constructed and operated butcher's shop. Where the output is large, special meat-carrying vehicles insulated, metal lined and if possible, equipped with hooks for hanging the meat is recommended. Care should be taken to ensure that carcass meat is not mixed with tripe or other offal.

Refrigeration of Carcasses

The carcasses with identification numbers after complete washing and inspection are brought to the chilling room where they are kept for about 24hrs to bring the pH below 6. The carcasses should be as dry as possible. The aim of chilling is to retard the bacterial growth during the post-mortem changes to extend the shelf-life of the meat. The temperature of the chilling room should be between 2°C and 4°C. The chilling room should always be kept clean and the carcasses hung on the rails. The chillers should not be overloaded and spaces should be left between carcasses for the cold air to circulate, otherwise cooling will be insufficient and carcass surface will remain wet for rapid bacterial growth.

Personal Hygiene and Cleanliness

For production of clean and wholesome meat, personal hygiene and attitude of the workers towards clean habits are very important. Personnel with clean hands, clothing and good hygienic practices are absolutely essential to the production of high quality meat.

All clothing should be clean and in good repair. No person working with meat should wear any kind of jewellery, badges or button that may come loose and accidentally fall on the product. All persons working with exposed meat should have their nail cut, hair cut or under control either completely covered with a clean cap or confined by hairnet to prevent the hair from falling into the product. Safety devices such as aprons and mesh gloves must be clean and in good repair. All unsanitary practices should be avoided by meat handlers. No one should smoke or use tobacco anywhere in the plant area. When handling meat, scratching the head, placing fingers in and around the nose or the mouth, sneezing or coughing on the product, should never occur. Staff should guard against contaminating the product from localised infection or sores.

Hands should be washed frequently to remove all visible soiling. Liquid disinfectant, soap and paper towels should be made available.

Post Mortem Examination

Definitions

Post Mortem Inspection is the examination of carcasses and organs after slaughter to assess whether these products are fit for human consumption.

Edible products are products that are fit for human consumption. This would include meat, certain offal, casing etc. from animals which have been examined and passed by an inspector.

Inedible products are meat products which are not fit for human consumption and would include such products as horn, hair, bone, bristle, blood.

Condemned meat is meat and meat products which have been found by an instructor not to be fit for human consumption. All diseased and defective carcasses or part of carcasses will be declared condemned material by the inspector and severely contaminated products may also be included in this category.

Routine post mortem examination of a carcass should be carried out as soon as possible after the completion of dressing in order to detect any abnormalities so that products only conditionally fit for human consumption are not passed as food. All organs and carcass portions should be kept together and correlated for inspection before they are removed from the slaughter floor.

Post mortem inspection should provide necessary information for the scientific evaluation of pathological lesions pertinent to the wholesomeness of meat.

Professional and technical knowledge must be fully utilized by:

1. viewing, incision, palpation and olfaction techniques.
2. classifying the lesions into one of two major categories – acute or chronic
3. establishing whether the condition is localized or generalized, and the extent of systemic changes in other organs or tissues.
4. determining the significance of primary and systemic pathological lesions and their relevance to major organs and systems, particularly the liver, kidney, heart, spleen and lymphatic system.
5. co-ordinating all the components of ante mortem and post mortem findings to make a final diagnosis.

6. submitting the samples to the laboratory for diagnostic support, if abattoir has holding and refrigeration facilities for carcasses under detention.

Carcass Judgement

Trimming or condemnation may involve:

1. Any portion of a carcass or a carcass that is abnormal or diseased.
2. Any portion of a carcass or a carcass affected with a condition that may present a hazard to human health.
3. Any portion of a carcass or a carcass that may be repulsive to the consumer.

Localized versus generalized conditions

It is important to differentiate between a localized and a generalized condition in the judgement of an animal carcass. In a localized condition, a lesion is restricted to a certain area or organ. Systemic changes associated with a localized condition may also occur. E.g. jaundice caused by liver infection or toxæmia following pyometra.

In a generalized condition, the animal's defence mechanisms are unable to stop the spread of the disease process by way of the circulatory or lymphatic systems. The lymph nodes of the carcass should be examined if pathological lesions are generalized. Some of the signs of a generalized disease are:

1. Generalized inflammation of lymph nodes including the lymph nodes of the head, viscera and/or the lymph nodes of the carcass.
2. Inflammation of joints.
3. Lesions in different organs including liver, spleen kidneys and heart.
4. The presence of multiple abscesses in different portions of the carcass including the spine of ruminants.

Generalized lesions usually require more severe judgement than localized lesions.

Specific Indication rendering carcass Unfit for human consumption.

The following diseases and conditions may result in the declaration of meat or carcass as unfit for human consumption.

- Actinobacillosis (generalized)
- actinomycosis (generalized)

- Anemia (advanced)
- Anthrax
- Black leg
- Botulism
- Brucellosis (acute)
- Severe bruising
- BSE
- Caseous lymphadenitis (generalized)
- *Cysticercus ovis* (generalized)
- Decomposition (generalized)
- Enteritis
- Fever
- Foot and Mouth Disease (FMD)
- Glanders
- Jaundice
- Malignant Catarrhal fever
- Mastitis (acute septic)
- Melanosis (generalized)
- Tumors (malignant or multiple)
- Viraemia
- Metritis (generalized)
- Odour(abnormal or sexual)
- Edema (generalized)
- Pericarditis (acute septic)
- Peritonitis (acute diffuse septic)
- Pleurisy (acute diffuse septic)
- Pneumonia (acute septic)
- Pyaemia
- Rabies
- Sarcocysts (generalized)
- Septicemia
- Stillborn/Unborn
- Swine erysipelas (acute)
- Tetanus
- Toxemia
- Trichinellosis
- Tuberculosis (generalized or with emaciation)
- Uremia

Routine Post Mortem Examination

Cattle

Head: The gums lips and tongue should be inspected for lesions of FMD, necrosis, stomatitis, actinomycosis, Actinobacillosis; the tongue being palpated from dorsum to tip for the latter disease. Incisions of internal and external masticatory muscles for *Cysticercus bovis* should be made parallel to the lower jaw. Retro pharyngeal, sub maxillary and parotid lymph nodes

should be incised for Tuberculosis lesions. The tonsils, of cattle and pigs frequently harbour tuberculosis bacilli and should always be examined and removed as unfit for food.

Sheep and goats

Vesicles and ulcers: These are commonly encountered in foot and mouth disease and Orf (contagious pustular dermatitis)

Judgment:

Partial condemnation of the affected parts.

Parasitic disease: *Oestrus ovis* larvae are deposited in the nostrils of sheep and invade the nasal cavity where a chronic catarrhal inflammation develops.

Judgment: Condemnation of affected head.

Pigs

Abscesses: Cases of abscesses should always be subject to a further inspection and examination for pyaemia

Atrophic rhinitis: This is a chronic condition in pigs the cause of which is not fully known.

Pneumonia is often found in animals suffering from atrophic rhinitis

Judgement: In the absence of systematic changes, the affection may be regarded as a local one, with condemnation of the head only.

Cysticercosis: *Cysticercus cellulose* is frequently found in the tongue and masticatory muscles of pigs in countries where parasite is commonly found.