MEAT HYGIENE

BY

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Food animals

The animals most commonly slaughtered for food include:

- Cattle and water buffalo for beef and veal
- Sheep and lambs for lamb and mutton
- Goats for goat meat
- Deer for venison
- Poultry(mainly chickens, turkeys, and ducks)

From farm to abattoir

Transport of livestock from farm to slaughter house involves a number of critical points which include:

- Loading of animals at the farm
- Transport from farm to abattoir
- Offloading of animals at the abattoir and slaughter

Effects of transport and movement include:

- Stress: Leading to high blood pressure and heart rate
- Bruising: Leading to production waste in the meat industry
- Trampling: This occurs when animals go down due to slippery floors
- Suffocation: This usually follows on trampling
- Sunburn: Exposure to sun affects food animals
- Dehydration: Animals subject to long distance travel without proper watering will suffer weight loss and may die
- Injuries: Broken legs

Factors must be taken into account during the journey in order that the animals do not become injure or die:

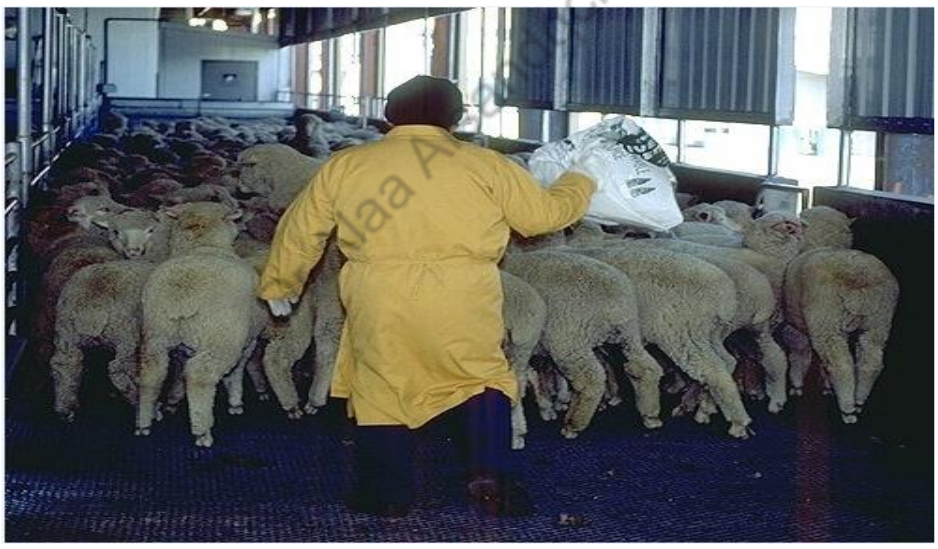
- Species of animals: Different species should not be mixed
- Time of the day: It is important to transport animals in vehicles during the cooler mornings and evenings or even at night
- Duration of journey: Journeys should be short and direct, without any stoppages. Cattle, sheep, and goats should not travel for more than 36 hours and should be offloaded after 24h for feed and water.
- Driving: Vehicles should be driven smoothly, without sudden stops. Corners should be taken slowly and gently

A slaughterhouse or abattoir

A slaughterhouse or abattoir is a place where animals are slaughtered for consumption as food.

Essential components of abattoir

1. Lairage: After transportation, animals are usually kept in a place where cattle or sheep may be rested on the way to slaughter for less than an hour to twenty-four hours. Resting time before slaughter depends on climate, the time spent by the animals in transit, the mode of transport, the general health of the animals, and the design of the lairage.



Lairage

2. Slaughtering Hall: Slaughtering Hall is a place where animals are stunning, bleeding, hanging, dehiding, removing of feet and head, and evisceration.

A. Stunning is done by using captive-bolt stunning for cow, electrical stunning for sheep, and carbon dioxide gas for pig to make the animal unconscious. However, stunning of carcass causes spots of blood in muscles due to increase in the blood pressure of the arterial and venous capillary. An increase in blood pressure and heart rate increases the rate of flow from a cut vessel five to ten times more rapid than in the intact vessel. If the bleeding operation is delayed, the carcass may be imperfectly bled and this may be accompanied by blood splashing (spots of blood in muscles).

Captive-bolt stunning (Cow)

Electrical stunning(sheep)

Stunning

B. Bleeding: Bleeding is done by cutting the carotid artery and jugular vein without cutting the esophagus. With the carcass hanging upside down and the major blood vessels cut, the majority of the blood is drained from the carcass

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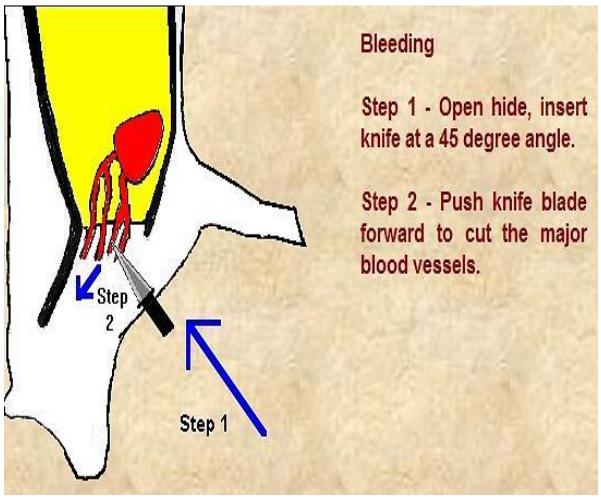


Bleeding

C. Hanging: Animals are hung upside down from shackles attached to an automated line

Hanging

D. Dehiding: Dehiding is done using automated machine that rotate in a circular motion to remove hide without damaging the carcass.

Dehiding

E. Removing of feet at the ankle joints

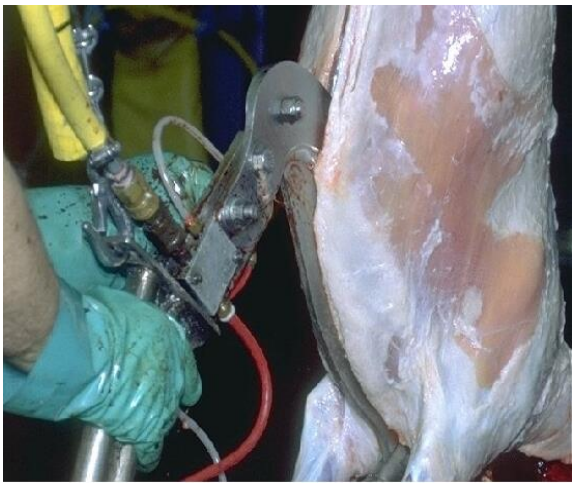
Removing of feet

F. Washing the carcass: The carcasses are washing for microbial and visible concerns using steam, hot water spray washes, and a steam-vacuum sanitizer.

Washing the carcass

G. Evisceration: Evisceration refers to the removal of internal organs. Internal organs can be classified in to edible and inedible viscera

Inedible viscera	Edible viscera
Spleen	heart
Esophagus	liver
lungs	

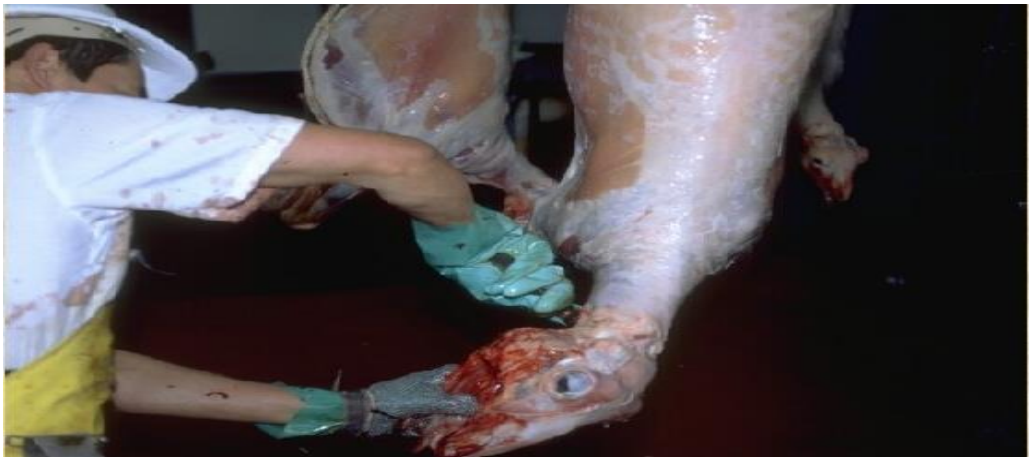



Removing of the viscera

H. Rewashing the carcass: The carcasses is now subjected to an organic acid wash helps to reduce the number of bacteria present on the tissue surface

Washing the carcass

I. The head is cut and removed

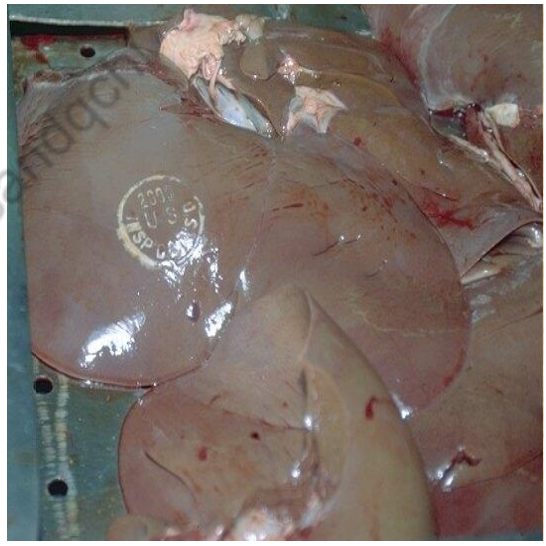


Removing of head

3.Processing hall: Carcass and viscera are inspected for identifying of disease or other condition using visual examination and palpation. Identify disease or other condition results in the removal or condemnation of the carcass from the processing line. Then, a stamp is applied to the carcass to identify it as inspected and passed for wholesomeness. Stamps used to mark carcass must be a non-toxic, non-corrosive material and readily cleanable.

carcass

viscera



stamp the carcass and viscera

4.Chilling room: Carcass is chilled by water spray-chilling

Chilling carcass

5. **Meat products processing unit**/ meat cutting room

Meat cutting room

6. **Storage:** Meat should be refrigerated around 30 °F to reduce the risk of microbial growth

7. **Laboratory**: Laboratory is essential not only for the primary diagnosis of animal disease but also to maintain the overall hygienic standards.

8. **Offices:** office is essential for the veterinarian / meat inspectors. The rooms should be provided with hand-washing and shower facilities, and lockers for clothing and meat inspection equipment.

9. **Effluent** plant/ waste water or sewage treatment

10. **Condemned meat room**: Condemned carcasses should be disposed off.

11. **Isolation block/emergency slaughter unit**: In abattoirs isolation block is necessary for isolation of suspected animals for its inspection and treatment and if necessary to do emergency slaughter in case injured animals. The isolation block will have a small lairage to keep four cattle with a slaughter hall, cooling hall, bacteriological laboratory, an incinerator and sterilization rooms.

Muscular haemorrhages or splashing

Muscular haemorrhages are a case associated with the slaughter of animal. They appear as dark-colored streaks or collection of dark spots. Blood splash is caused by rupture of capillaries, usually between stunning and sticking times. The factors cause splashing is stress of animal after long joinery or delay between stunning and bleeding.

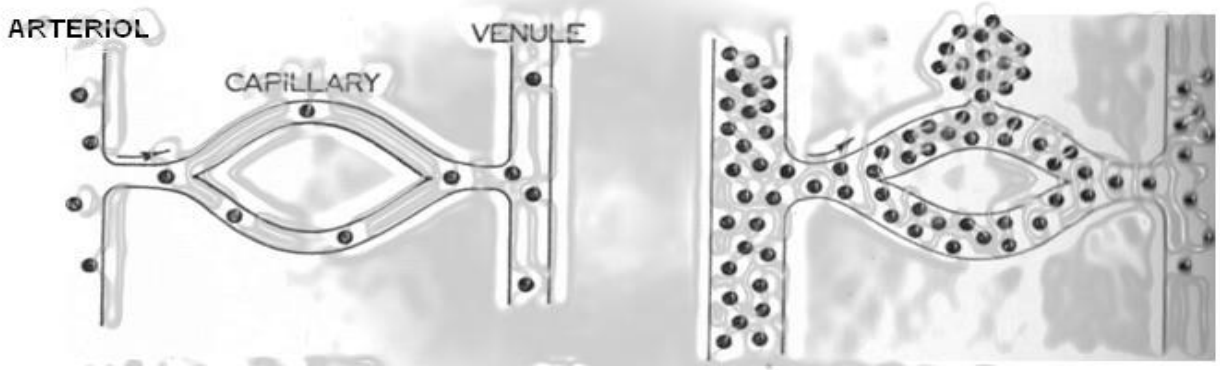
Muscular haemorrhages

The mechanics of blood splashing

When the vessels of arterial system are in state constriction during stress or application of current the capillaries contain relatively little blood, but when electrical stimulus stopped the arterioles undergo immediate vaso-dilatation and the effect of this is the passage of blood, possibly by rupture of the capillary wall, into the surrounding tissue to cause a rush of blood into the capillaries.

The effect of this sudden suffusion of the capillaries, which are already weakness by anoxia or oxygen lack, is to permit the passage of blood, possibly by rupture of the capillary wall or diapedesis, into the surrounding tissue.

Splashing of muscles



Vaso-Constraction of arteriole which occurs during application of current

Vaso-Dilatation which occurs with electrical stimulus ceases

Vaso-constriction of arteriole occurs during application of current, but vaso-dilation occurs when electrical stimulus stopped.

Judgment

There is no reason for condemnation of meat affected with splashing as it is not less durable and may safely be used in finely minced made-up foods.

Rigor Mortis

Rigor Mortis is the first post-mortem change which occurs in muscle of all the voluntary muscles. It is characterized by a hardening and reduction of all the voluntary muscles. It begins at the head and neck, extending backwards to involve the body and limbs.

The factors effect on development of rigor mortis

The development of rigor mortis is influenced by different causes:

1.The atmospheric temperature: A high temperature accelerating its onset whereas a low temperature delays it.

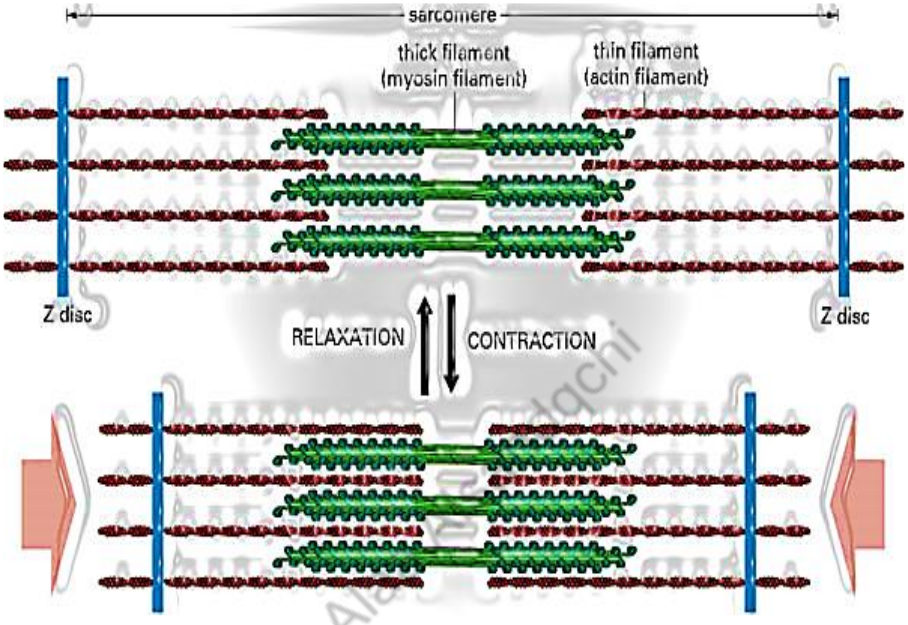
2. The health of animal: Rigor mortis may be absent or seldom evident in animals is slaughtered while affected with a febrile condition. Physiologically, rigor mortis in normal animal does not appear in skeletal muscles until 9 to 12 hours and then gradually declines.

3. Drugs: Certain drugs are encouraged the early onset of rigor mortis, including sodium salicylate, alcohol, and ether.

4. The degree of muscular activity prior to slaughter: Rigor mortis affects first the muscles that have been most active and best nourished prior to death. The heart is affected very early within an hour of slaughter. Rigor reaches its greatest intensity in the left ventricle and this cavity usually free of blood on post-mortem examination.

Role of ATP in muscle contraction and rigor mortis

During live, ATP is needed to attach and detach the myosin heads from actin. After slaughter, when ATP runs out, some myosin heads are still attached and cannot detach, causing rigor mortis.



Animal organs and their uses

The skeletal system and skin

1. The bones: Bones contain much fat in the medullary cavity, and this is used as stock for the preparation of soup.

Bones animal

2. The skin: The skin is not used for human food. Portions of muscle which remain on the inside of hides, particularly the ear muscles, are sometimes trimmed off and used for human food.

Sheep skin

Cow skin

The digestive system:

1. The Tongue: In all food animals, the tongue is used for food either fresh or salted

Cow tongue

Sheep tongue

2. The stomach: In all food animals, the cleansed and processed stomach (rumen, reticulum, and omasum) is used as the raw material from which tripe is prepared. The sheep rumen is also used as container for haggis.


3. The intestines: In all food animals, the cleansed and processed intestines are used as containers for sausage meat.


4. The liver and bile: In all food animals, the liver is used for food either fresh or salted. A medicinal extract is also obtained from it for the treatment of anemia. Bile is used as a cleanser and by the leather industry for polishing purposes.

5. The pancreas: In all food animals, pancreas is sold for food as the sweet bread. The medicinal product insulin, which is used in the treatment of diabetes, is obtained from pancreas.

Sweet Bread

6. The spleen: The spleen is used as food for cats and dogs

The respiratory system:

Lung: The lung of the food animals is used as an ingredient of white puddings and for cat and dog meat

white pudding

The circulatory system:

The heart: The heart of all food animals is sold fresh

The excretory system:

The kidney: The kidney of all food animals is sold fresh

The reproductive system:

The Udder: The udder of both cow and ewe is boiled and used for food