

Guidelines for Post-mortem examination of food animals

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Abbreviations:

PMI : Post-mortem inspection

Glossary:

Carcass:-means the body of any slaughtered animal after bleeding and dressing.

Condemnd:-means a slaughter animal or meat that has been inspected and judged as unfit for human consumption and branded accordingly "Total Condemnation", if the entire carcass and offal are condemned (Judgement Symbol T) ." Partial condemnation", if only parts of the slaughtered animal are condemned, while others are judged otherwise (Judgement Symbol D for the condemned diseased or defective parts).

Dressed or Dressing:-

a- in relation to slaughtered animals except for pigs, sheep and lambs, goats and kids, means the removal of head, hide or skin, viscera (including or not including kidneys) ,genital organs, urinary bladder and feet up to the carpal and tarsal joints, and udders of lactating animals, animals that have calved or are in advanced pregnancy; and

b-in relation to slaughtered pigs, means the removal of hair and bristles or skin, claws ,eyelids, viscera(including or not including kidneys) , genital organs, urinary bladder, udders in the case of lactating animals, animals that have farrowed or are in advanced pregnancy, and the external acoustic duct unless in respect of that part an alternative effective form of cleaning is carried out; and

c-in relation to sheep and lambs, goats and kids means the removal of the head (except in the case of young lambs and young kids), the pelt or skin including that of the head ,viscera (including or not including the kidneys), genital organs, urinary bladder and feet up to the carpal and tarsal joints, and udders of lactating animals, animals that have given birth or are in advanced pregnancy;

d-in relation to cattle and pigs includes where necessary splitting of the carcass to split means dividing the carcass lengthwise on the medial line.

"Offal" in relation to slaughtered animals any edible or non-edible part of the animal other than the carcass.

Edible offal:- in relation to slaughtered animals means such offal as have been passed as fit for human consumption.

Emergency slaughter. means slaughter by necessity of any food animal which has recently suffered accident or injury ,or which is affected by a disease which does not necessarily call for total condemnation at meat inspection, which however is likely to deteriorate unless slaughter takes place immediately .

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Judgement:- means the decision taken by an inspector, based on ante-and post-mortem inspection, by which meat originating from the examined animal is approved for human consumption, totally condemned, partially condemned, conditionally approved, inferior meat and/or approved for human consumption with distribution restricted to limited areas

Meat: - means the edible part of any mammal slaughtered in an abattoir.

Non-edible offal:- in relation to slaughtered animals means such offal's which are regularly considered as non-edible and which may be specified as such in the national meat inspection legislation.

Viscera:- means the organs of the thoracic and abdominal cavity.

Post-mortem examination

The aim of post-mortem inspection is to ensure that only the meat fit for human consumption is passed for food.

Significance

1. Protect consumers against zoonotic diseases.
2. Protect consumers against food-borne infections and intoxications and hazards associated with residues (drugs, pesticides, hormones, etc.). N.B.: 1% of slaughtered animal must be examined for residues.
3. Protect consumers from falsification.
4. Protect livestock against spread of diseases (notifiable).

Post-mortem inspection includes:

I- Macroscopic examination "Abattoir inspection"

1. Obligatory inspection "Routine post-mortem".
2. Further inspection for suspected cases.

II- Laboratory examination

1. Trichoscopic examination.
2. Bacteriological examination.
3. Additional examination
 - a) Determination of pH, degree of bleeding.
 - b) Determination of abnormal odour and colour.
 - c) Determination of early decomposition and setting.
 - d) Detection of residues.

General directions before post-mortem examination:

1. Post-mortem inspection should be carried out in the slaughter hall and directly after slaughter.
2. Post-mortem inspection carried out by the same inspector who done ante-mortem inspection.
3. The inspector should be supervising the dressing of each carcass to prevent substitution of diseased organ with healthy one.
4. The inspector should have 2 knives to prevent cross contamination and facilitate post-mortem examination.
5. Head and viscera should be hanged to their carcass.
6. Every organ should be examined by inspection, palpation, olfaction and incisions.
7. Avoid carcass contamination with floor and hide.
8. Suspected carcass must be detained in the detention room for further examination.

Post-mortem examination of cattle

A-Obligatory (Routine post-mortem)

I- Carcass inspection:

Before proceeding the post-mortem inspection, particular attention should be paid the following

1. The state of nutrition:
 - a) Well fleshed.
 - b) Poor.

- c) Emaciated.
- 2. Any evidence of injuries, bruising, haemorrhage, abnormal colour, abscess and fractures.
- 3. Local or general oedema.
- 4. Efficiency of bleeding.
- 5. Any signs of deformities of bone and joint.
- 6. Age and sex of the animal.
- 7. Abnormal odour.
 - a) Sexual odour (male sheep, goat, pig).
 - b) Uraemia.
- 8. Condition of pleura and peritoneum.
- 9. Lymphatic system affections:
 - a) Leukosis.
 - b) Caseous lymphadenitis.

II- Blood:

During the process of bleeding, the inspector should observe and examine the evacuated blood, especially in cases of emergency slaughter.

- 1. **Clotting ability** (fails to clot in case of septicaemia and toxemia).
- 2. **Colour:**
 - a) Pale in anaemia
 - b) Reddish white in leukaemia.
 - c) Dark red in fever.

III- Head: Examination of the head includes:

- 1. **Teeth** for aging of the animal.
- 2. **Lips and gums** for presence of ulcers.
 - a. F.M.D.
 - b. Stomatitis
 - c. Actinomyces.

- d. Cattle plague.
- 3. **Tongue** examined for:
 - a. Actinobacillosis.
 - b. F.M.D.
 - c. Cysticerci (making of longitudinal incision along its middle line).
- 4. Examination of **external and internal masseter** muscles for cysticerci by made incision parallel with lower jaw.
- 5. Incisions of **lymph node** For tuberculosis, actinobacillosis and abscesses
 - a. Retropharyngeal.
 - b. Sub maxillary.
 - c. Parotid.
- 6. **Mucous membranes of eyes for:**
 - a. Jaundice (yellowish).
 - b. Fever (congested).

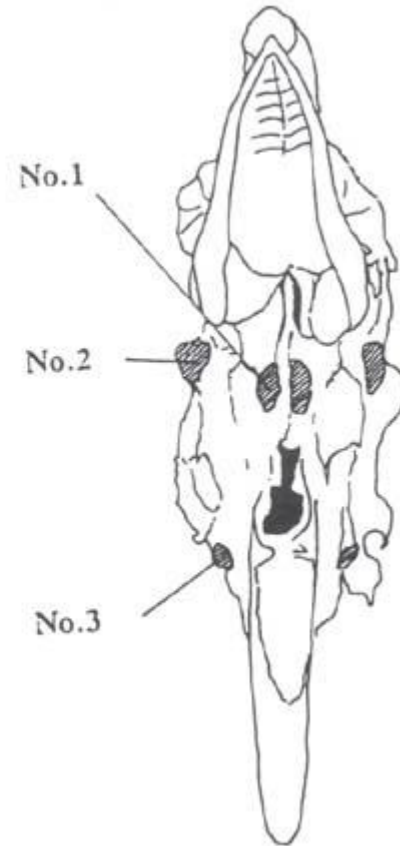
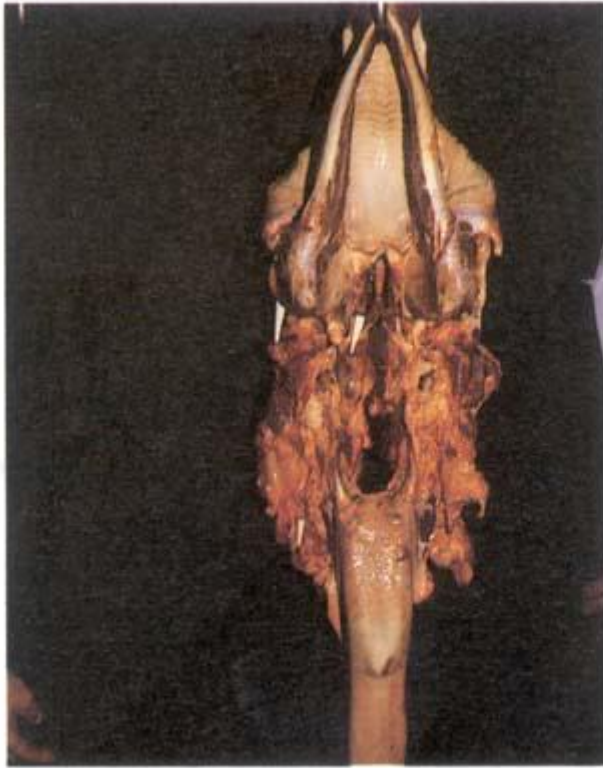


Fig. 1: Head inspection. Retropharyngeal (No. 1), parotid (No. 2) and submaxillary (No. 3) lymph nodes are viewed and incised by multiple incisions and slicing.



Fig. 2: Head inspection in buffalo.

IV- Pluck (lungs, trachea, oesophagus).

1. Oesophageal muscle

- Sarcosporidia “Buffaloes”.

2. Lung

a. Inspection:

- Pneumonia.
- Melanosis.

b. Palpation:

- Hydatid cyst.

- Abscess.
- c. *Incision:*
- Left bronchial lymph node and mediastinal Lymph node for T.B.
 - Lung tissue (exposed by deep incision from the base to the apex of each lung, trachea & main branches of the bronchi) for:
 - i. Parasites.
 - ii. T.B.
 - iii. C.B.P.P.
 - iv. Abscess.

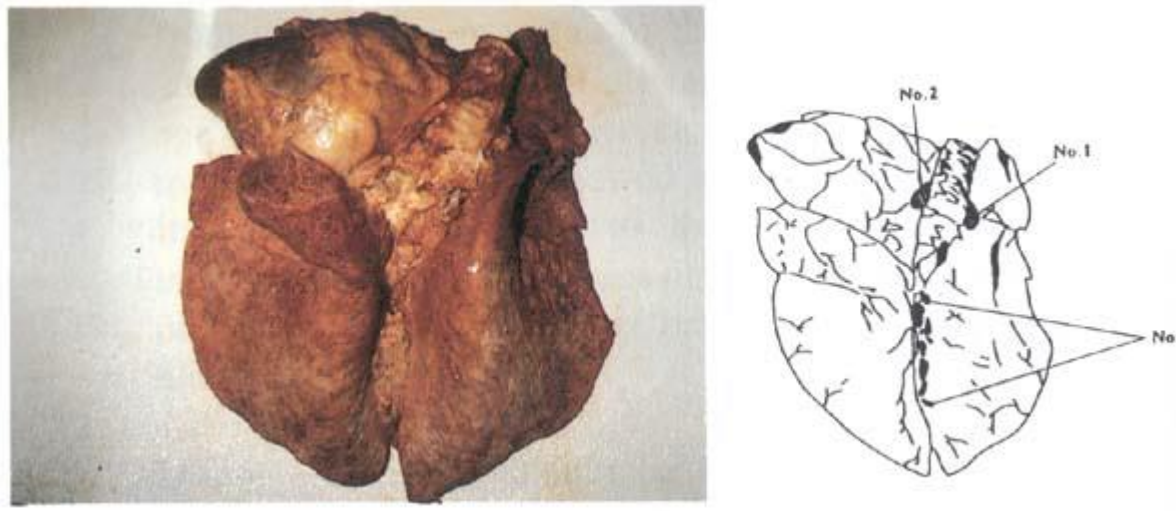


Fig. 3: Lung inspection - Bronchial left (No. 1) and right (No. 2) and mediastinal (No. 3) lymph nodes are viewed and incised.



Fig. 4: Lung inspection in buffalo - Open trachea and incised bronchial and mediastinal lymph nodes.

V- Heart:

1. Pericardium:

- a) Traumatic pericarditis.
- b) T.B.
- c) Haemorrhages.

2. Epicardium:

- a) Petechial hemorrhages.

3. Myocardium:

- a) Cysticerci.
- b) Hydatid cyst and Linguatulae.

4. Endocardium:

- a) Petechial haemorrhages.
- b) Endocarditis, Vegetative endocarditis (Chronic swine erysipelas).

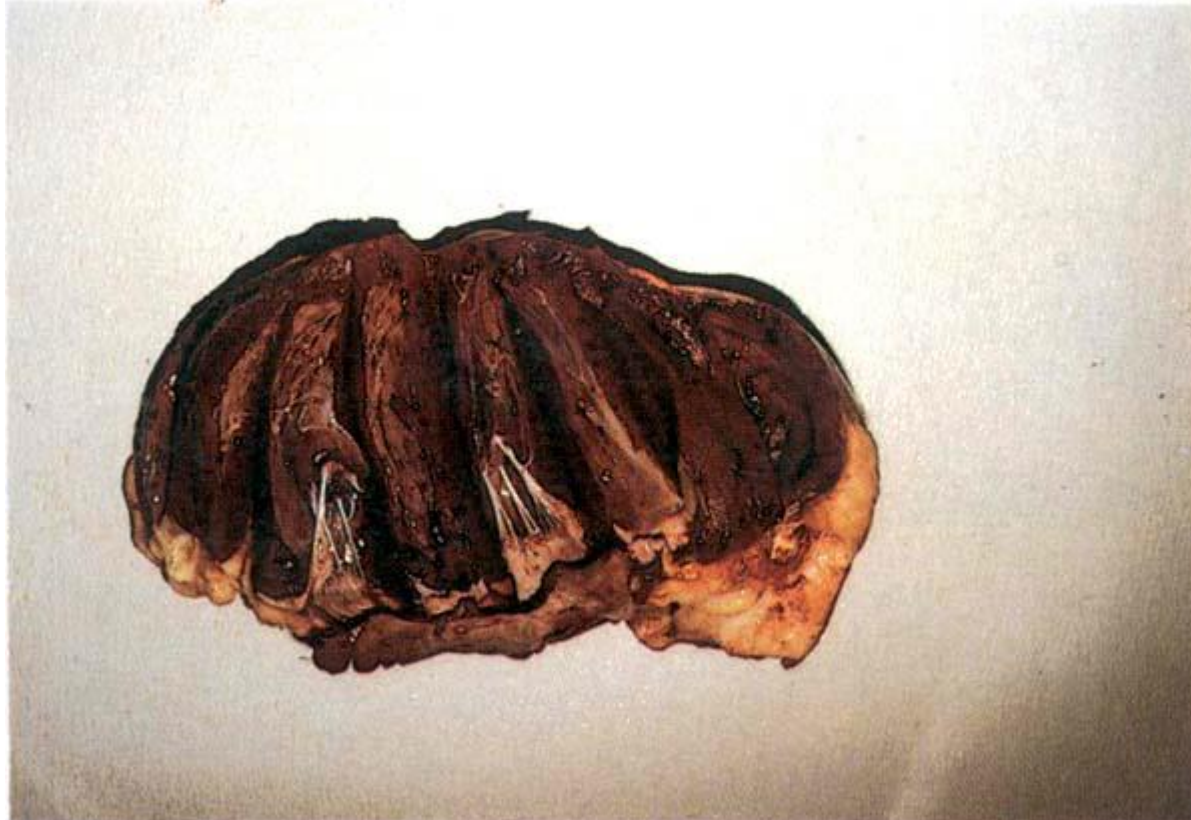


Fig. 5: Heart inspection - Lengthwise incisions (minimum four) from base to apex into the heart muscles.

VI- Liver

1. Inspection:

- a. Focal necrosis.
- b. Telangiectesis.
- c. Degeneration (Fatty change).

2. *Palpation:*

- a. Abscess.
- b. Hydatid cyst.

3. *Incision at the base of the caudate lobe to examine the bile ducts.*

- a. Liver tissue:
- b. Cirrhosis.
- c. Anthrax.

4. *Hepatic lymph node:*

- a) T.B.

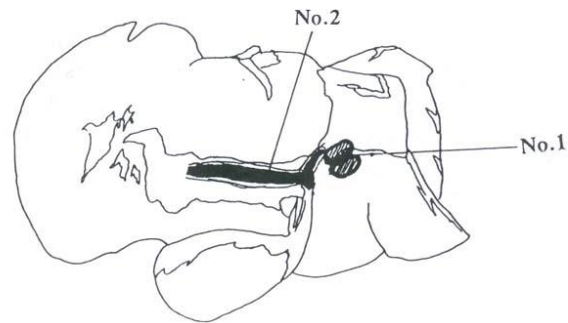


Fig. 6: Liver inspection - Incised portal (hepatic) lymph nodes (No. 1) and opened large bile duct (No. 2).

VII- Spleen:

1. Inspection:

- Enlargement:
- Blood parasites.
- Anthrax.
- Leukemia.

2. Palpation:

- Tumour.
- Hydatid cyst.



Fig. 7: Stomachs and spleen inspection - Viewing of rumen and viewing and palpation of spleen.

IX- Kidney

1. Inspection:

- Renal fat gelatinous in emaciated carcass.
- Kidney capsule for petechial haemorrhage in septicaemia.

2. Palpation:

- Inflammation.
- Tumours.
- Cysts.

3. Incision:

- Kidney tissue:
 - Emboli.
 - Pyelonephritis.
- Renal lymph node for "T.B.

IX- Udder:

1. **Inspection** for mastitis.
2. **Palpation** for abscess.
3. **Incision** by along and multiple deep incisions in the udder tissue and supra- mammary lymph node for T.B.
4. In Brucellosis reactors the udder is removed intact without incision and without handling.

X- Testes:

1. Inspection for orchitis.
2. Incision of superficial inguinal lymph node for T.B.

XI- Stomach, intestine and omentum

1. Inspection:

- Parasites.
- Enteritis.
- Tumours.

2. Incisions in mesenteric lymph node for:

- T.B.
- Linguatula.



Fig. 8: Viewing of rumen, reticulum, omasum and abomasum.



Fig. 10: Superficial inguinal and internal and external iliac lymph nodes in a pig. Viewed and palpated on routine P/M examination.

XII- Uterus

- The uterus should be inspected, palpated, if necessary, incised, care being taken to prevent contamination of the carcass. In Brucellosis reactors the uterus must not be incised or handled.
- Endometritis

XIII- Feet

- F.M.D.
- Foot rot.

Additional inspection of cattle or further examination

1. Suspected or evidence of T.B.

- a) Re- inspects internal organs and its lymph node.
- b) Thorough inspection of carcass lymph node, serous and mucous membranes.

2. Presence of cysticerci

- a) Re-inspect internal and external masseter muscle and tongue.
- b) Re-inspect shoulder and thigh muscles, diaphragm by making incisions.

Post-mortem inspection of calves

1. As cattle, but some procedures should not be done.
 - No incisions in muscles (heart, masseter), Inspect superficial surface of heart for cysticerci.
 - No incisions in the liver (no cirrhosis).
2. Special attention should be given for:
 - a) Mouth& tongue for F.M.D. and calf diphtheria.
 - b) Liver, Portal and posterior mediastinal lymph nodes for congenital T.B.
 - c) Navel for navel ill or pyaemic umbilicus.

- d) Joint for swelling or pyaemic arthritis.
- e) The small intestine for White scour or dysentery.
- f) The appearance and consistency of the renal fat.

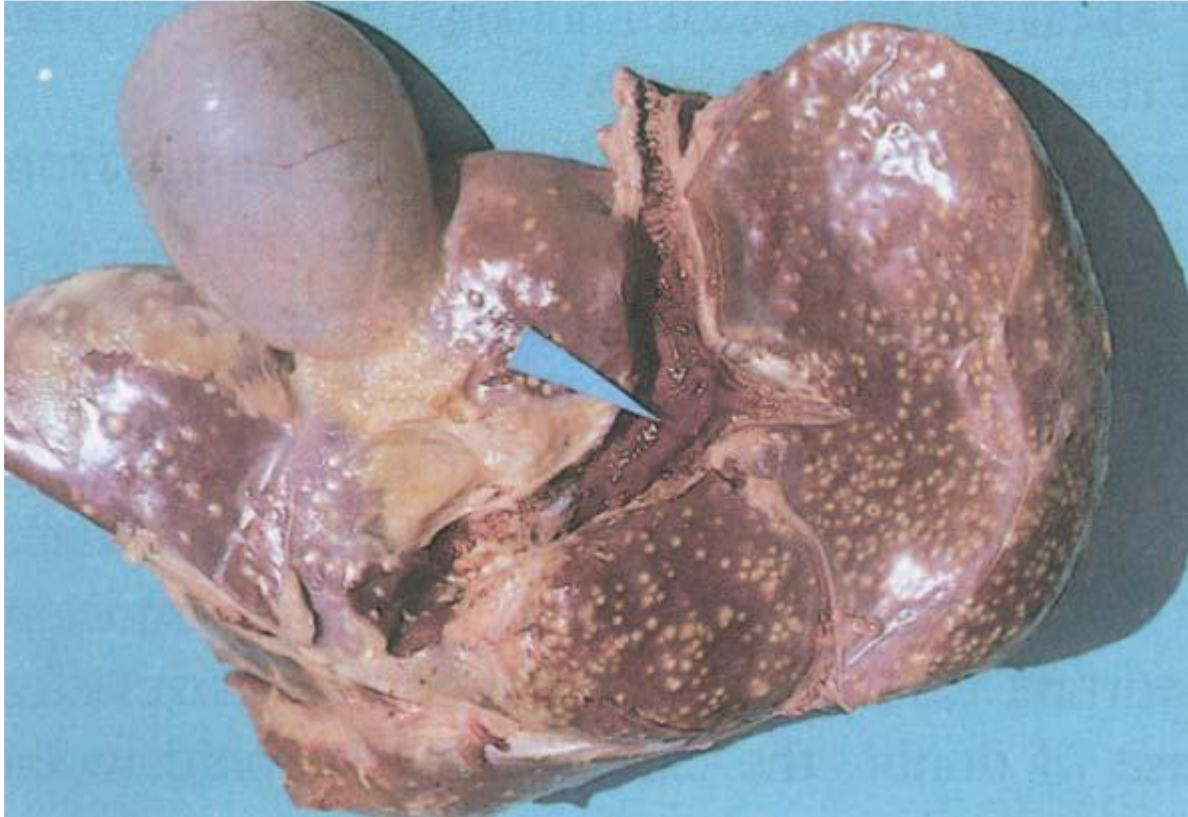


Fig.11: Multiple abscesses in the calf liver as a result of an umbilical infection; carcass with such condition should be condemned.

Post- mortem examination of sheep and goats

The procedures as cattle with some modifications: -

1. **Head**

- a) No incisions in tongue, masseter and lymph nodes.
- b) Splitting of the head for examination of brain for:
 - *Coenurus cerebralis*
 - *Oestrus ovis* larvae.

• **Lungs**

- a) No incision in the lymph node is necessary.
- b) Incisions of lung tissue for:
 - Lung nematodes.
 - Hydatid cyst
 - Pneumonia

3. **Liver:**

- Liver cirrhosis
- Liver fluke.
- *Cysticercous tenuicollis*.
- Focal necrosis.

4. **Spleen** for Anthrax.

5. **Lymph nodes** for *caseous lymphadenitis*.

6. **Omentum** for *cysticercous tenuicollis*.



Fig. 12: Caseous lymphadenitis. Firm and dry abscess in the kidney.

Post mortem examination of camel

The procedures as cattle with special attention should be given for:

- Examination of heart, tongue, masseter muscles, diaphragm, fore and hindquarter for *C. dromederi* and *C. bovis*.
- Inspection and incisions of the costo-cervical. (prescapular.), deep inguinal, internal iliac, external iliac and superficial inguinal L.ns.

- Inspection of the subcutaneous tissue for *Onchocerca spp.*
- Palpation and inspection of the lung, liver & spleen for hydatid cysts.

Post mortem examination of pigs

The same as cattle with some modifications: -

1. **Skin lesion:**

- a) Swine erysipelas.
- b) Swine fever.
- c) Urticaria.

2. **Lung:**

- a) Pneumonia.
- b) T.B.

3. **Mesenteric, sub maxillary and supramammary lymph nodes for:**

- a) T.B.
- b) Leukaemia.

4. **Udder**

- a) T.B.
- b) Mastitis.
- c) Actinomycosis.
- d) Abscess.

5. Joint Swelling (chronic swine erysipelas).

6. Muscles {thigh muscles, pillars of diaphragm, intercostal muscle, heart, tongue & larynx.} for *Cysticercous cellulose*.

7. Trichinoscopic examination: -

8. It is obligatory routine microscopic examination.

9. Samples from 2 pillars of diaphragm and cut into 7-14 portions on comperissorium and examined using Trichinoscopic for the presence of *Trichinella spiralis* larvae cyst.



Fig. 14: Swine erysipelas. Diamond shaped skin lesions.

Inspection of Emergency slaughtered Animals

Carcasses of emergency slaughtered animals must be subjected to a careful inspection because most causes of food poisoning are associated with the consumption of such flesh. Therefore, bacteriological examination of such carcass should be including. Injured or ill animals arrive to the slaughterhouse in one of the following three conditions.

1. *The animal may arrive alive but in a moribund state:*

Injured should be made to identify the nature of the disease, accident or medicine. Such animals in a moribund state bleed badly and stiffen immediately after slaughter. Judgment depends upon:

- (a) Bleeding
- (b) Setting.
- (c) The colour of fat and serous membranes.
- (d) Causes of conditions.
- (e) The condition of the meat.

2. *The animal may arrive slaughter and uneviscerated:*

All animals slaughter outside the abattoir, no matter what explanation is offered by the owner as to the cause of the death, it is necessary to examine a blood smear from the ear or tail, only when it is proved that the animal slaughter is not due to anthrax should the unless slaughter has occurred less than an hour or two previously coldness of the extremities and in cattle, evidence of tympanitis in the left flank are indication that slaughter has not been recent. In sheep which have been dead for some hours the wool is easily pulled out and tympanitis will be observed in the left flank.

Special attention should be paid to the condition of the uterus for sign of septic metritis, intestines for enteritis and the serous membranes for putrefaction. Judgment depends upon the bleeding condition, setting and the condition of the meat. Generally the carcasses which bleed badly their setting is lacking and signs of putrefaction are seem of the pleura and peritoneum and the carcasses are condemned.

3. *The animal may arrive slaughtered but bleed and eviscerated:*

These carcasses are very difficult to judge specially if they are not accompanied by the internal organs. It is advisable to condemn the carcass if it is not accompanied by some of the organs but an important one is missing, the carcass must bacteriologically examine, or otherwise condemned. Especially attention should be made to the examination of the carcass lymph nodes for enlargement, hemorrhages or tuberculosis and to the kidneys for degree of bleeding.

The degree of congestion and setting of the carcass should also be noted, and if a bovine carcass shows any degree of congestion a smear from the kidney or lymph node should be examined microscopically for anthrax. The vertebrae in cattle should be examined for tuberculosis caries and the pleura and peritoneum for evidence for stripping, while an incision should be made into the musculature for the presence of any abnormal odour and should this be detected a portion of meat should be subjected to a boiling test. This uterus should be examined for septic metritis, the udder for septic mastitis and the intestines for enteritis.

In emergency slaughtered animals, only in cases where the animal has been a short slaughtered, shows no evidence of disease (result of bacteriological examination is satisfactory) and in which the carcass sets and looks normal in every way, should be considered fit for consumption. If setting is lacking and signs of putrefaction are seen on the pleura and peritoneum the carcasses should be condemned.

International decisions at post-mortem examination

The final Judgment is based on the total evidence produced by observation, palpation, incision, smell, ante-mortem signs and the result of any laboratory tests.

- A Approved for human consumption
- I approved as inferior quality
- L Approved for distribution in restricted areas
- K_{f,h} Conditionally approved for human consumption
- D Partial condemnation

T Total condemnation
f=freezing
h=heat treatment

1-Approved for human consumption (A):

When the post-mortem examination revealed no evidence of any abnormal condition or disease, the carcass including the edible offal's should be approved for human consumption without any restriction.

2-Totally condemned (T):

The carcass and offal's should be condemned in one or more of the following conditions:

- a. If they are hazardous to food handlers, consumers and /or livestock,
- b. If they contain chemical or radioactive residues which exceed the permissible limits,
- c. If the meat has been conditionally approved for human consumption, but such meat has not treated as stipulated.
- d. There is severing organoleptic deviations from normal meat.

3-Partially approved for human consumption (D):

In case of localized defects resulting from disease or other abnormalities, affecting only part of the carcass or offal's, the affected parts shall be condemned, while the remaining parts shall be approved for human consumption.

4-Conditionally approved for human consumption (K):

Carcass that are hygienically unsatisfactory or that hazardous to human or animal health, but may be treated under official supervision and judged as conditionally approved for human consumption. The organs should be treated in the same manner as carcass.

K may be classified into:

Kh= means that meat treated with heating.

Kf= means that meat treated with freezing.

Methods of treatment of conditionally approved carcass:

- a. Heat treatment by boiling: The period of time required for such heat treatment should be determined in accordance with the size and weight of the meat to be heated. The temperature must be reaching 90°C in the centre of the meat; the time thus required however, shall not be less than 150 minutes.
- b. Heat treatment by steaming: Steaming of meat under pressure (0.5 kg/cm²) in autoclave for 1-1.5 hours according to the case.
- c. Treatment with freezing: Before distribution of meat, it should be undergo freezing at temperature below -10°C for at least 10 days.
- d. Treatment with pickling: Pickling for 3-4 weeks at 8-10°C in a pickle or brine solution 25% is reliable for meat cuts less than 2.5 kg weight.

5-Inferior quality meat (I):

Meat is safe from the hygienic point of view, but shows minor deviation from the generally accepted quality standard (e.g. slight abnormal odour, taste or colour, poor carcass etc...) it may be approved for human consumption on condition that the consumer is aware of its inferior quality, therefore such meat should be sold only in special shops under the supervision of the authority (low price or used for manufacturing purposes).

6-Approved for human consumption, with distribution in restricted to limited area (L):

Meat obtained from animals coming from area kept under quarantine because of an outbreak of a dangerous contagious animal disease may be approved for distribution in restricted area, providing no hazard to human health is involved. Such meat should not be distributed or marketed outside the infected and strictly controlled area, in order to avoid a possible spread of the animal disease concerned e.g. FMD.

Meat derived from animals coming from restricted area that have been vaccinated and may be carriers of a disease agent should not be marketed and distributed outside this restricted area, especially when such vaccination is not being practiced in neighbouring area.

References

Herenda,D.,Chambers,P.G.,Ettriqui,A.,Seneviratna,p. and de Silva,T.J.P.,2000. Manual on meat inspection for developing countries. FAO animal production and health paper 119.Roma, Italy.

Collins,D.,Huey,R.J. (2015). Gracey,s Meat Hygiene 11th ed WILEY Blackwell.UK.