

Dr. Mohanad Faris Abdulhameed
PhD in Veterinary Public Health
Department of Public Health
College of Veterinary Medicine
University of Basrah
Fifth YEAR-Class- Meat Hygiene

Decisions or Judgments declare by veterinarians related to Bacterial, Viral, Parasitic diseases

- **The following decisions at post-mortem examination.**

The final judgement as to the action to be taken with a carcass or parts of a carcass is based on the total evidence produced by observation, palpation, incision, smell, ante-mortem signs and the results of any laboratory test. It is essential, therefore, that the results of ante-mortem and supporting laboratory tests are available to the veterinarian when he is making the final decision.

A- Parasites diseases infection and meat hygiene judgments

Hydatidosis or hydatid cysts

Brief description of the diseases: This is a small tapeworm of the dog with intermediate hosts which include domestic and wild ruminants, man and primates, pigs. Eggs are passed in the faeces of the dog. After ingestion by the intermediate host, for example, sheep, the ova hatch and the oncospheres penetrate the gut wall and travel to the liver (70%) or lungs (25%) and occasionally to other organs and tissues (5%). Transmission to humans is not via consumption of infested bovine organs but through the handling of infected dogs or contaminated soil, water or food.

Post mortem examination: presence cyst or more in the lung and liver in the carcass of slaughtered animals.

- *Judgment: The affected organs with lesion of the cysts is totally condemned. If the carcass is affected by emaciation of muscles therefore it needs to be totally condemned with bury or burn.*

Cysticercosis

Taenia saginata, *C. bovis* – is also called “beef tapeworm; ‘beef measles’

Beef measles are small pea-sized fluid-filled cysts that contain a small immature tapeworm. They are found in the muscles of the jaw, tongue, heart and diaphragm of cattle. Humans can be infected when they eat undercooked infected meat with the cysticercosis, which after that will develop to adult worm in the intestine of human.

The below table indicates the judgements on *C. bovis* findings

Number	Location	Status	Cyst	Judgment
More than one	Generalised	Viable	1	Reject the carcass and the offal
One or more	Localised	Viable Caseous or calcified	1 (v) 1 or more (nv)	Reject affected organ or carcass part Require cold treatment of remainder
More than one	Generalised	Caseous or calcified	1 (nv)	Reject the affected organs or carcass parts Require cold treatment of remainder

nv, non-viable; degeneration has occurred; v, viable.

Liver fluke worm (*Fasciola hepatica*)

The parasite infestation *F. hepatica* affects only the liver and causes acute swelling and congestion of the liver.

-lesions of post mortem examination

Many bores on the surface of the liver at the first sight due to presence of adult parasite inside liver tissues as well as in the bile ducts. The liver is gorged with blood (swelling) and congested. In chronic cases, the parenchyma of the liver is enlarged and thick and may abscess. The whole carcass characterised by general emaciation and icterus because of the liver damage.

- *Judgment: it depends on the extent of the fluke lesions and the condition of the carcass. Severe infestation with associated emaciation that would go to total condemnation of the carcass. Mild, moderate and heavy infestation without emaciation may have a favourable judgement. If the parasitic lesions in the liver are circumscribed, the liver may be salvaged after trimming of affected tissue.*

Blood parasites (Redwater fever& theileriosis)

Redwater is caused by different species of Babesia (*Babesia divergens*, *Babesia bigemina*) and with symptoms of anaemia, fever, and malnutrition). Like, theileriosis is also one of most important blood parasites caused by *Theileria* spp and the illness of animal characterised by icterus as a common symptom.

- *Judgment: As known both of these parasites species is not communicable to human (not-zoonosis), therefore depends of a degree of general condition of animal health or a carcass which also important to ensure the infection by these parasites as a blood sample need to be subjected to a test before a final judgment. If there is a significant emaciation on the carcass, the decision is going to be condemnation of the animal carcass as would be not suitable human consumption.*

Protozoa meat invasion:

Toxoplasma gondii

1-*Toxoplasma gondii* is a unicellular protozoan parasite that is ubiquitous through the world. It causes disease called toxoplasmosis. *T. gondii* has two types of hosts: definitive hosts and intermediate hosts. The definite hosts are domestic cats and other members of the family *Felidae*. Intermediate hosts are many warm-blooded animals, including humans and birds.

2- *T. gondii* has a complex life cycle and multiple infection routes are possible. The parasite can be transmitted to humans via undercooked meat containing infective tissue cysts (bradyzoites) and by the oocysts (sporozoites) from the environment shed in the faeces of cats.

3-water contaminated with infective oocysts can be an infection source or transmission vehicle for humans. Consumption of raw or undercooked pork, beef and lamb, especially, has been associated with an increased risk of toxoplasmosis. Meat-borne infections can be prevented through cooking the meat thoroughly, which effectively kills the *T. gondii* tissue cysts.

4-The risk of toxoplasmosis due to meat, such as poultry, which is usually consumed well cooked, is considered to be low. Raw or undercooked lamb, a delicacy in some countries, is an important source of *Toxoplasma* infection.

Diagnosis of toxoplasmosis

Toxoplasma cannot be detected macroscopically during meat inspection because the tissue cysts are invisible to naked eye. The testing methods are based on direct detection of *T. gondii* organisms or DNA in tissue or on indirect detection of the infection by demonstrating specific

antibodies in serum or meat juice. Currently used molecular and histological methods are rather insensitive to detect *T. gondii* in meat because the density of these parasites is usually low and may vary from site to site. The indirect methods have their disadvantages, too, giving false-negative results at the early stage of the infection before the antibodies appear.

Antemortem findings:

1. Neonatal mortality
2. Fever (40 – 42°C) and pneumonia in young pigs
3. Difficult breathing and coughing
4. Weakness and wasting
5. Incoordination and trembling
6. Diarrhoea
7. Abortion in pregnant animals and stillbirths

Post-mortem findings:

1. Pneumonia
 2. Hydrothorax
 3. Ascites
 4. Intestinal ulceration
 5. Necrosis in the liver, spleen and kidneys
 6. Inflammation of the lymph nodes
 7. Multiple granulomatous lesions in the brain
- **Judgement:** Carcasses of animals showing clinical signs of acute disease are *condemned*

Nematoda meat invasion:

***Trichinella* spp.**

1-Nematodes (roundworms) in the genus *Trichinella* are characterized by a wide host range and geographical distribution. Among the helminthes, *Trichinella* has a unique life cycle since it completes the whole life cycle in the same host: (i) the enteral phase, (ii) the migratory phase and (iii) the muscle phase of infection.

2-The main sources of human trichinellosis are raw or improperly processed pork and pork products, game meat and horse meat

3-Many techniques are used for detecting antibodies against *Trichinella* antigens. The most reliable and widely used techniques for diagnosing human trichinellosis are enzyme-linked immunosorbent assays (ELISA) and immunoblotting (western blot). Among commercially available ELISA kits

4- Trichinelloscopy (diagnosis meat), which is done by pressing small pieces of meat between glass plates and then using microscope for detection, is not a sensitive method, and thereby it is not allowed in the official meat inspection any more. The species identification of the larvae is done by PCR

- *Veterinary judgment: Carcass affected with trichinosis must to be condemned.*

B-Bacterial infection and meat inspection judgment

Actinomycosis (Lumpy Jaw) and Actinobacillosis (Wooden Tongue)

This is a chronic suppurative and granulomatous disease chiefly of cattle but less commonly of sheep, horse and man.

1- *Actinomyces bovis* is responsible for actinomycosis of bone in cattle- affect bone- the lower jaw is more often affected than the upper. Sometime

2- *Actinobacillus* affect soft tissue (tongue) and adjacent lymph nodes.

- *Judgment: The affected organs with actinomycosis and actinobacillus including the head, tongue, stomach or lung should be condemned. In some circumstances, depended on a degree of infection whether is slight and confined to the tongue or lymph nodes of the head, shall be removed if the degree is slight or if there is a puss that would completely removal the head of the animal. On other hands, generalized lesion warrant total condemnation of carcase and offal.*

Anthrax

Anthrax is an infective disease of animal and humans which are occur in an acute phase. Although the disease is a worldwide distribution, it restricts to particular area especially where the soil is neutral or alkaline in reaction. The disease is infected all animal species. The main cause of anthrax is the bacteria bacillus anthrax.

The disease in its onset and is manifested by high fever, bloody diarrhoea, with discharge of dark, red, tarry, uncoagulated blood from the nose, mouth, and anus, and in lactating animal a complete cessation of the milk yield. In the dead, rapid abdominal distension is obviously seen.

Post-mortem examinations should not be undertaken on suspected anthrax cases including any animal that has died suddenly for no apparent reason) until a blood smear has proved negative. If a carcass is opened, the spleen is usually swollen and there is bloodstained fluid in all body cavities. A marked effusion of blood-stained serous fluid into the connective

tissues of the blood, with engorgement of the blood superficial veins of skin and muscles. All other vital organs (heart, liver kidney) are red and swollen and friable as a result of cloudy swelling

- *Judgment: the meat from anthrax-infected animals is dangerous to humans and a carcass must be burned in an isolated place.*

Botulism: the disease caused by *Clostridium botulinum* and manifested by progressive muscular paralysis. The disease infected human and animal.

Post-mortem findings: the pathogen as long as release a toxin that cause diffuse intestinal haemorrhage may be observed on post-mortem examination.

- *Judgment: Total condemnation of carcass because of human hazards.*

Blackleg (Blackquarter)

It is an acute infective disease of the ox and sheep caused *Clostridium chauvoei* and characterised by sever inflammation of muscles with toxæmia and high mortality. The carcass of blackleg can be recognised from the connective tissues surrounding the swelling is infiltrated with a yellow gelatinous substance which may be haemorrhagic and permeated gas bubbles. The peripheral lymph nodes are acutely enlarged and haemorrhagic. The vital organs are extremely congested.

- *Judgment: after the animal carcass confirmed infected with blackleg, it the carcass should be totally rejected.*

Brucellosis.

The disease caused by *Brucella abortus* in cattle and *Brucella melitensis* in sheep.

Brucellosis (contagious abortion, Bang's disease)

Brucellosis of cattle is an infectious, contagious disease caused by *Brucella abortus* and is characterized by abortion in late pregnancy and a high rate of infertility. *B. melitensis* affects goats, *B. ovis* sheep and *B. suis* swine. *B. abortus* may occur in horses.

Transmission: An uninfected animal may become infected with Brucella organisms by contaminated feed, pasture, water, milk, by an aborted foetus, fetal membranes and uterine fluid and discharges. The disease may also be spread by dogs, rats, flies, boots, vehicles, the milking machine and other equipment used in the barn. The Brucella organism may be occasionally shed in urine.

Antemortem and post mortem findings:

- In cattle
 1. Abortion in non-vaccinated pregnant cows in the last 3 - 4 months of pregnancy
 2. Occasional inflammation of testes and epididymis
 3. Swelling of scrotum (one or both sacs)
 4. Oedematous placenta and foetus
 5. Hygromas on the knees, stifles, hock and angle of the haunch, and between the nuchal ligament and the primary thoracic spines.
- In sheep
 6. Fever, increased respiration and depression
 7. Inferior quality of semen in rams
 8. Oedema and swelling of scrotum
 9. In chronic stage enlarged and hard epididymis, thickened scrotal tunics and frequently atrophic testicles.
 10. Infertility in rams and abortion in ewes
- **Judgement:** *livestock carcasses affected with brucellosis are approved (after removal of affected parts), as Brucella bacteria remain viable for only a short period in the muscles after slaughter. In acute abortive form (after the miscarriage), cattle carcasses are condemned. Sheep, goat and buffalo carcasses require total condemnation. Heat treatment may be recommended in some areas for these species due to economic reasons. Affected part of the carcass, udder, genital organs and corresponding lymph nodes must be condemned.*

Tuberculosis: it is a chronic disease of many animal species and poultry caused by bacteria of the genus *Mycobacterium*.

Post-mortem findings:

- 1-excess-serohemorrhagic fluid in the body cavities and subcutaneous tissues, bronchopneumonia, fibrinous pleuritis, and an enlarged spleen, liver and lymph nodes. The placenta may be oedematous and hyperaemic.
- 2- Epididymitis, orchitis and seminal vasculitis.
- 3- Enlargement of lymph nodes.
- 4-Nodules on the pleura and peritoneum
- 5-Bronchopneumonia
- 6- Firmer and enlarged udder, particularly rear quarters

- *Judgment: Carcasses are condemned*

Haemorrhagic septicaemia

Haemorrhagic septicaemia is a systemic disease of cattle, buffalo, pigs, yaks and camels. It is caused by *Pasteurella multocida* type B of Carter. Outbreaks of this disease are associated with environmental stresses such as wet chilly weather and overworked, exhausted animals. It is specific type of Pasteurellosis distinct from other forms of *Pasteurella* infections.

Post mortem findings:

1. Subcutaneous swellings characterized with yellowish gelatinous fluid especially around the throat region, brisket and perineum.
 2. Enlarged haemorrhagic lymph nodes.
 3. Haemorrhage in the organs.
 4. Pneumonia.
 5. Rarely haemorrhagic gastroenteritis.
 6. Petechial haemorrhage in the serous membranes which are extensive in some cases.
- *Judgement: Carcass of an animal affected with haemorrhagic septicaemia is condemned. If the disease is diagnosed on antemortem examination, an animal should not be allowed to enter the abattoir. Dressing of such a carcass would create potential danger for the spread of infection to other carcasses.*

Listeria monocytogenes

1-The genus *Listeria* contains eight species, of which two are pathogenic, causing disease called listeriosis: *L. monocytogenes* is pathogenic to humans and animals and *L. ivanovii* causes mainly abortions in ruminants.

2- Listeriosis appears mainly in two forms: severe invasive listeriosis and non-invasive febrile gastroenteritis. Invasive listeriosis manifests as sepsis, meningoenzephalitis, perinatal infection and abortion. Non-invasive gastroenteritis can manifest in immune-competent adults and it is usually self-resolving. *L. monocytogenes* can also produce a wide range of focal infections and occur in cutaneous form mainly as an occupational disease of veterinarians and farmers.

3-The main route of transmission is through the consumption of contaminated food and many listeriosis outbreaks linked to foods have been reported. The majority of listeriosis cases are

linked to refrigerated, ready-to-eat (RTE) foods that are consumed without reheating, such as RTE meat products, smoked fish and soft cheese.

4- *L. monocytogenes* has several characteristics that enable its survival in the food chain. *L. monocytogenes* can survive and grow over a wide range of temperature, pH (4.0–9.6) and water activity (a_w 0.9) limits as well as under aerobic and anaerobic conditions

- *Veterinary judgment: carcass rejection by veterinary authority after confirm the infection from the laboratory report.*

C-Viral infection and meat hygiene judgment

Blue tongue

The disease is not zoonosis disease and only transmitted between animal livestock (by the bites of sand flies of culicoides species)

Post mortem examination: the tongue is swollen and cyanotic. Hyperaemia, haemorrhages, erosions and/or ulcers in the mucosa of the gastrointestinal tract from the mouth to the forestomach. The heart may contain petechiae, ecchymoses and necrotic foci. The skeletal muscles may have focal haemorrhages or necrosis.

- *Judgment: depend on the type and extent of the lesion, and the condition of the carcass. If the carcass showing emaciation thus would be condemned while less seriously affected carcass can receive a more lenient judgment.*

Bovine spongiform encephalopathy (BSE) or called Prion disease, Mad Cow disease)

The disease is a neuro-degenerative fatal brain disease of cattle. It is believed to cause Creutzfeldt–Jakob disease (CJD) in humans. The disease is only confirmed by pathological test examination at the lab. Cattle are believed to have been infected by being fed meat-and-bone meal that contained the remains of cattle who spontaneously developed the disease or scrapie in sheep.

- *Judgement carcass infected with BSE: the carcasses and offal should be rejected with burned or buried.*

Three-Day Sickness

It is virus infection transmits by biting insects. The lesion characterises by enlarge lymph nodes and congestion and petechiation of serous membranes, small intestine, kidney and emphysema of lung.

- *Judgment: total condemnation but in case of letting animal to be recovered the animal would be approval for the marketing.*

Foot and mouth disease

FMD is an acute viral and extremely contagious disease of cloven-footed animals such as cattle, sheep, goats, pigs and antelope. It is manifested by vesicles and erosions in the muzzle, nares, mouth, feet, teats, udder and pillar of the rumen. There are three main strains of viruses causing FMD, namely A, O and C. Three additional strains, SAT 1, SAT 2 and SAT 3 have been isolated from Africa and a further strain ASIA-1 from Asia and the Far East.

Lesion or Post mortem findings:

1. Necrosis of heart muscle usually only in young acutely infected animals.
 2. Ulcerative lesions on tongue, palate, gums, pillars of the rumen and feet.
- *Judgment: If FMD is suspected on post mortem examination the carcass and viscera are condemned.*

Rinderpest (RP)

Rinderpest is an acute, highly contagious, fatal viral disease of *cattle, buffalo* and *wild ruminants* manifested by inflammation, haemorrhage, erosions of the digestive tract, wasting and often bloody diarrhoea. Some swine species are also susceptible. Man is not susceptible to RP virus.

Lesion or Post mortem findings:

1. Punched out erosions in the oesophagus.
2. Oedema or emphysema of the lungs.
3. Haemorrhage in the spleen, gallbladder and urinary bladder.
4. Haemorrhagic or ulcerative lesions in the omasum.
5. Congested abomasum filled with bloody fluid. Ulcers may also be observed.
6. Severe congestion and haemorrhage in the intestine and enlarged and necrotic Peyer's patches.
7. Last portion of the large intestine and rectum are haemorrhagic showing “tiger stripping” of longitudinal folds.
8. Enlarged and oedematous lymph nodes.

9. Emaciated carcass.

- *Judgement: The carcass derived from a feverish and debilitated animal showing the sign of acute disease on antemortem examination should be condemned. In the areas free of RP and in zones where final stages of eradication exist, the animals are also condemned. In endemic zones, if acute symptoms of the disease are not present during clinical examination, the carcass may have limited distribution. In areas affected with outbreak which are protected by vaccination, heat treatment of meat is suggested if economically worthwhile. The affected organs are condemned.*

Lumpy skin disease

Acute pox viral disease of *cattle* manifested with sudden appearance of nodules on the skin.

Lesion or Post mortem findings:

1. Ulcerative lesions in the mucosa of the respiratory and digestive tract.
 2. Reddish, haemorrhagic to whitish lesions in the lungs.
 3. Oedema (interlobular) and nodules in the lungs.
 4. Heart lesion (endocardium).
 5. Thrombosis of skin vessels followed by cutaneous infarction and sloughing.
- *Judgement: Carcass of an animal showing mild cutaneous lesions and no fever associated with general signs of infection is conditionally approved pending heat treatment. The affected parts of the carcass and organs are condemned, Carcass of an animal showing, on antemortem examination, generalized acute infection accompanied with fever, is condemned.*

Rabies

The disease also known as hydrophobia. It is an acute infectious viral disease of the central nervous system in mammals.

Transmission: It is usually transmitted through the saliva by a bite from a rabid animal, commonly the dog or jackal. Man is infected the same way.

Lesion or Post mortem findings: inflammation of gastrointestinal mucosa however lab test is needed to confirm the presence of the virus.

- *Judgement: In endemic areas carcasses may be approved if the animal was bitten eight days before slaughter and within 48 hours of slaughter. The bite area and surrounding tissue must be condemned, and prevention taken to prevent occupational hazards.*