Veterinary necropsy technique

A. General considerations

Before commencing a post mortem examination (necropsy) a case history should be obtained. Although this may be of considerable help towards arriving at a diagnosis, one should be careful that a history suggestive of a particular disease does not blind you to other possibilities. A post mortem examination should never be done merely to confirm a clinical diagnosis or one suggested by a history. An open mind must be kept. Apart from the primary disease, other interesting or valuable information may be obtained from a well carried out necropsy.

All domestic animals with the exception of the horse are dissected lying on their left side with the dissector facing the ventral surface of the animal.

Remember that the entire carcass, including all systems and organs, must be carefully examined. Lesions may appear anywhere and care should be taken to expose and examine all lesions. Examine each of the paired organs.

B. Identification of the animal

It is important that in our records you identify the animal as to species, breed, age, sex, brands, eartags or other identifying features, such as colour or special markings. This is of particular importance in cases where animals are insured or where court cases could follow.

C. External examination of the animal

Before dissection begins, the animal is examined externally for signs of autolysis, putrefaction, rigor mortis, wounds, evidence of diarrhoea, blood or discharges present at the body orifices or any other abnormal feature. The position of the body in death and external signs of struggling should be noted, as they may be pertinent to the final diagnosis.

D. Preliminary review and observations

1st. Signalment -species, breed, sex, age, weight, identifying marks.

2nd. History and clinical diagnoses

3rd. Clinical Pathology

4th. External appearance

1. State of nutrition

2. Mucous membranes
3. Body orifices
4. General conformation
5. Superficial lesions - tumors, dermatitis, etc.
6. Hair coat
7. Parasites
8. Check lips, gums cheeks, teeth.

E. Opening the body cavities

1st. Incise skin at axilla

1. Continue the ventral midline skin incision anteriorly to the symphysis of the mandible and posteriorly to the right side of the perineum. Do not damage the udder. To avoid cutting hair, incise the skin from the subcutaneous side.

2nd. Raise the right from leg and scapula and dissect to lay back dorsally. Skin the right side dorsally to expose the entire right side. Examine the exposed superficial lymph nodes and jugular veins.

3rd. Raise the right hind leg, incise skin then disarticulate the coxo-femund artenlation, examine synovial fluid.

4th. Examination of mammary glands or testes.

1. Mammary glands and mammary lymph nodes are completely cut away from the body.
2. Examine for symmetry, swellings, tumors, atrophy.
3. Examine the lymph nodes and incise them.
4. Incise the gland through the cistern and teat canal, examining each portion.

   One. Palpate for thickenings, fibrosis, tumors.

5th. Examine prepuce and penis.

6th. Make a paracostal incision through the abdominal wall just behind the parallel to the last rib. Extend it dorsally to the vertebrae and ventrally to the midline. Raise the body wall so that viscera is not cut.

7th. Make a pralumbar incision through the abdominal wall caudally to the pelvis. Reflect the muscle wall downward and expose the abdominal cavity.

8th. Palpate the diaphragm and note the tension of the diaphragm.

9th. Cut the diaphragm on the right side in an arc from the sternum along its costal attachments to the vertebral column. Listen for inrush of air indicating a negative pressure in the pleural cavity.

10th. Sever the ribs at their sternal and vertebral ends with a pruning shear or other suitable instrument and lift off the thoracic wall, thus exposing the entire thoracic cavity. Dissect free one central rib and

break if possible to check for generalized bone lesions.

11th. Cut through the pubic symphysis opening the pelvis. Examine the prefemoral lymph node.

F. Gross examination of the thoracic and abdominal cavities

1st. Examine both cavities and all contents carefully without disarranging the viscera to any extent.

1. Look for transudates, exudates, hemorrhage. Also open the pericardial sac now. Note amounts, color and consistency of abnormal fluid accumulations.
2. Examine for adhesions, displacements, absence of organs, size and symmetry or organs in situ.
3. Mentally note the organs showing lesions and perform detailed examination of them on removal.
4. Take initial samples for microbiology, especially exudates in body cavities.

G. Examination of the thoracic viscera

1. Separate the mandibles at the symphysis. Cut along the lingual surface of both sides of the mandible. Loosen the tongue and pull it down between the rami. Disarticulate the hyoid bones; tongue, larynx, trachea and esophagus are dissected ventrally back to the thoracic inlet. Lift up viscera and detach heart and lungs from the body wall by cutting dorsal and ventral mediastinum. Include the aorta, post cava and esophagus back to about 2-3 cm anterior to the diaphragm. Sever and remove the thoracic viscera.

2 Examine thyroid, parathroids, and thymus glands.

One. Note size, shape, consistency, etc.

Two. Incise glands in large animals.

3 Arrange the organs in approximately normal position.

One. Examine tongue by incising transversely.

Two. Open esophagus and examine carefully.

Three. Examine the bronchial lymph nodes by palpating and incising.

Four. Observe and palpate lungs for consolidation, emphysema, or other abnormal consistency.

Five. Open the larynx, trachea, bronchi, and small bronchioles.

(1) Look for exudate, hemorrhange, foreign bodies or lung worms in bronchial tree.

(2) Examine areas of consolidation and other abnormal lung

by incising them.

4 Examine the heart

One. Remove the heart from lungs at the level of large blood vessels.

Two. Observe any disproportion of parts (dilation, hypertrophy, anomalies) and alterations in shape. Note presence of normal adipose tissue.

Three. Open heart

(1) Position the heart so that the right atraium faces the prosector. Cut through the right atrial free wall (including the auricle) horizontally. Examine the endocardium and vena cava. Examine the atrial side of the right A-V valve. Check for sufficiency of the valve and integrity of corda tendinea.

(2) Cut through the right A-V valve and wall of the right ventricle, keeping ghe incision near the septum. Continue the incision around the right ventricle through the pulmonic valve, and pulmonary artery. Examine for patent ductus arteriosus at this time.

(3) Open the left atrium and examine the same manner as the right atrium. Cut through the left A-V valve, incising the ventricle through the mid-portion of the free wall. Continue the incision to the apex. Make a horizontal incision in the ventricle approximately mid-way between the coronary groove and the apex, incising from the first cut to the septum. At the septum, cut upward through the aortic valve and aorta. This process should result in a small flap of left heart with aortic valve on one side and left A-V valve on the other.

(4) Examine vessels, valves and septa for anomalies.

(5) Examine endocardium and mycordium.

2nd. Remove the spleen. Examine grossly and incise several times.

3rd. Examine pancreas grossly.

4th. Incise the duodenum adjacent to the bile duct. Squeeze gall bladder to see if bile enters the intestine.

5th. Remove the stomach and intestines to the rectum.

1. Place the rectum over the lumbar area when it is cut so that the abdomen will not be contaminated.
2. Free the intestine from the mesentery as it is removed and observe its lymph nodes.
3. The examination of the gastro-intestinal tract is postponed until last so that instruments are not contaminated.

6th. Remove and examine the liver.

1. Examine the peritoneal surface for fibrosis or adhesions.
2. Free the liver from the diaphragm.
3. Note the size, shape, weight, color and consistency.

4. Open the gall bladder and the larger bile ducts.

   One. Examine for stones, inflammation, flukes, thickening of wall.

5. Palpate and incise the liver liberally from the abdominal surface. Look for necrosis, fibrosis, abscesses, etc.

7th. Examine the adrenal glands before kidneys are disturbed.

1. Cut adrenals in cross section and note cortical-medullary ratio.

8th. Remove genito-urinary organs as a unit, including the vulva, rectum and anus.

1. Cut each kidney longitudinally in half from the convex surface to the hilus and note alterations in color, consistency, size, etc.
2. Strip off capsule and examine the kidney surface.

   One. Note ease with which the capsule comes off.

3. Open and inspect the ureters, bladder and urethra.

   One. Inspect all mucus and serous surfaces.

4. Open vagina, cervix and uterine horns along their dorsal borders and examine carefully all surfaces.
5. Examine ovaries for cystes, corpora lutea, atrophy etc.
6. Observe male accessory sex organs. Observe size, consistency, inflammation, etc.

H. Examination of the musculo-skeletal system.

1st. Open the stifle, hock, and humero-scapular joints. (To open the stifle cut the straight patellar ligament 1/3 the way proximally to the tibial tuberosity and medial to the trochlea of the femur and reflect the patella).

One. Observe synovia, articular surfaces, articular cartilages and synovial membranes.

2nd. Examination of the muscular system.

1. Examine and incise the muscles of various parts of the body especially lumbar and thigh muscles. Check development, color, etc.

3rd. Examination of the skeletal system.

1. Rib previously examined.
2. Examine body for broken bones or healed fractures.
3. For marrow inspection, saw out the center of body of a thoracic vertebra, or observe it in the rib, humerus or femur.

I. Examination of the eyes.

1st. Remove the eyeball from the orbit (if indicated; not routine).

1. Incise periorbital tissues and avoid direct contact with the eye.
2. Look for corneal opacities, cataracts, tumors, etc.

J. Examination of CNS.

1st. Remove the head from body at atlanto-occipital articulation. Incise the spinal cord before excessive traction is placed on the skull.

2nd. Reflect skin and muscles of head and examine skull for traumatic lesions.

3rd. Remove the brain as described below.

1. Make a transverse cut behind orbits (varies in species), using saw, cleaver of axe.
2. Make lateral cuts from ends of transverse cuts <u>just medial</u> to the occipital condyles (<u>leave room for brain to be removed intact</u>.
3. Lift off bony cap carefully with a chiesel. Incise the dura over the dorsal brain surface and incise the tentorium cerebelli.
4. Hold the skull with the nose pointing upward and tap it gently on the table. Carefully cut the olfactory tracts and other cranial nerves and allow the brain to slip out. Avoid traction on the brain.
5. Remove the pituitary gland by cutting diaphragmatiac sella on both sides, clipping the bony projection around the gland with scissors.

4th. Observe the dura.

5th. Incise the brain <u>transversely</u> (slices every centimeter) and look for lesions. (When whole brain is to be fixed, make only one transverse cut into lateral ventricles so fixative can enter).

6th. Use striker saw to expose the spinal cord in small animals (not routine) by cutting through the vertebral column longitudinally, just off center, with band saw or axe.

K. Examination of the gastro-intestinal tract.

1st. The esophagus has been opened.

2nd. Open the stomach along the greater curvature.

1. In ruminants particular attention is paid to the abomasum and first 10 feet of the small intestine.
2. Observe the serosal and mucosal surface. <u>Ingesta must be removed</u>.
3. Examine for hemorrhage, parasites, foreign bodies, abnormal ingesta, etc.

3rd. Open the small intestine. Observe all surfaces and ingesta. Leave 2-

3 cm segments closed for histology.

1. Use screen technique for collecting parasites (not routine).

4th. Open the cecum and colon back to the anus and examine carefully.

L. Species-specific procedures.

1st. Horse:

1. When the abdomen is opened, move the left parts of large colon cranially so that the pelvic flexure is lying anterior. Move the cecum dorsocranically, the small intestine of the right flank, and the small colon posterior and down.
2. The mucosa of the guttural pouches is examined when the head is disarticulated.
3. The cranial mesenteric artery should be opened from the aorta past the ileal-cecal and colic artery bifurcations.

2nd. Ruminants:

1. When the abdomen is opened, place small intestine and colon over the right lumbar area. Examine forestomachs and abomasum for position and adhesions.
2. Remove small and large intestine as a unit, open the small and large intestine, examine, the mucosa for lesions. Leave 2-3 cm segments closed for histology.
3. Remove forestomachs and abomasum as a unit. Separate serosal attachments to stretch the organs out. Open and examine each organ. Remove ingesta and rinse the rumen mucosa with water to examine.

Obtaining and Preserving Specimens for Histopathologic Evaluation

1st. **Obtaining specimens**:

1. Make sure it is representative of the lesion observed.
2. Don't wash tissue before sectioning; hypotonicity may induce artifacts.
3. Include normal tissue at the outer edge of the lesion where possible.
4. Make incisions with a sharp knife or scalpel. Don't use scissors; they crush and distort the specimen.
5. Use forceps carefully and sparingly; they may crush and distort the specimen.
6. Specimens must not be over 0.5 to 0.7 cm in thickness to allow for adequate penetration of formalin to get complete fixation.
7. Breadth and width are not as important if sufficient fixative is used. Generally though, specimens should not be over 3 cm square.
8. To be sure that you will have the necessary specimens to submit, always take a section from a routine set of tissues in addition to those with gross evidence of lesions. After they have fixed you may select from the group the ones you wish to submit. A routine sampling should include the following: tonsil, thyroid - parsthyroid, lung, papillary muscle-left ventricle, bronchial lymph node, liver, kidney, adrenal, spleen, pancreas, urinary bladder, genital glands, stomach, intestines, mesenteric lymph nodes.

2nd. **Preserving specimens**:

1. Use 10% phosphate buffered formalin. Needs to be buffered to prevent the formation of acid hematin which forms a black percipitate and makes histologic evaluation difficult.

   (One) Preparation of one liter of 10% buffered formalin:

Formaldehyde Solution (37-40%)	100 ml
Distilled Water	900 ml
Monobasic Sodium Phosphate	4.0 gm
Dibasic Sodium Phosphate	6.5 gm

   If the phosphates are not available, the acidity can be neutralized by adding calcium or magnesium carbonate to excess.
2. Place 10% formalin in a receptacle that has a mouth width equal, or nearly so, to the diameter of the container. This is needed to allow for easy removal of tissue one it is fixed.
3. When placing specimens in the 10% formalin provide 10 volumes of fixative for each 1 volume of tissue. This will provide sufficient opportunity for all faces of the tissue to come in contact with the fixative.
4. Tissues for histopathologic evaluation should nevear be frozen. Freezing and thawing disrupts cells and causes severe artificats.

Collection of specimens for other laboratories

1. Bacteriology

a. Routinely sample an intestinal loop with the mesenteric lymph nodes

b. Sample any organ with lesions.

c. Peritoneal or thoracic fluid will be taken in special containers (sterile bottles).

2. Toxicology

a. Eye fluid for nitrate poisoning.

b. Pieces of liver, kidney, urine, stomach contents.
If stomach is quite empty, don't open, submit the whole stomach closed.

3. Virology

a. Use small plastic jars, submit small pieces 3x2 cm according to disease.

b. Feces from the colon or rectum 2-3 ml from young calves with diarrhea (for Rota, Corona).

4. Parasitology

a. 2-3 ml diarrheic feces for crytoporidium.

b. Segment of intestine and feces from the rectum for gastro-intestinal parasites.