

# Postmortem Examination of Feedlot Animals

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## Introduction

As the demands of food animal practice continue to shift from individual animal medicine to population and production medicine, the need to generate sensible approaches to preventive animal health has become even more important. Necropsies provide data crucial in understanding the pathogenesis and pathophysiology of diseases in veterinary medicine. In addition, these examinations enable the veterinarian to more accurately monitor the frequency of disease occurrence in a population. The knowledge obtained from postmortem examinations is essential for the development of rational preventive and therapeutic strategies in a population.

All veterinarians have seen postmortem examinations at some point in their veterinary education. As students, most veterinarians concentrated on differentiating abnormal findings from normal findings, regardless of their significance. Mastering a technique that would enable them to perform informative, complete postmortem examinations was not a priority. Furthermore, those veterinarians that did learn a suitable technique were usually unable to later adapt it to practice situations. The net result has been a large number of food animal practitioners that are reluctant to perform necropsies because they are unable to conduct a rapid, informative and complete postmortem examination under field conditions.

Individual pathologists disagree about the ideal process that should be followed when conducting a postmortem examination. However, the general consensus among them is that the most important aspect of performing quality necropsies is for each individual to develop a methodical approach that he or she feels comfortable with and adhere to it. In addition to being methodical, the technique employed by practitioners needs to be efficient and suitable for field conditions.

The purpose of a necropsy is to examine all of the body systems, not any abnormalities, and combine the results to arrive at a diagnosis. While examining each body system sequentially is informative and easily replicated from animal to animal, this method is time consuming and logistically difficult. The simultaneous evaluation of all of the body systems contained within a particular anatomic portion of the carcass enables these problems to be circumvented. The objective of this presentation is to demonstrate an informative, efficient, easily replicated field

necropsy technique that can be adapted to individual needs and preferences.

## Preparation

A location for the necropsy should be chosen prior to beginning the procedure. Although the site selected should be an isolated area away from the main activities of the feedlot, it must be easily accessible to the veterinarian and for the transportation of the carcass to and from the site. The discreetness of the site is also an important factor. The spot should not be an eyesore for the feedlot or other members of a community.

Should it be necessary to euthanize an animal to facilitate its humane disposal and necropsy, there are several methods available. The use of a standard firearm is a humane and acceptable method of euthanasia even though it can be aesthetically unpleasing to some people. It is an appropriate mode of euthanasia if there is no prior evidence of central nervous system dysfunction. In situations where central nervous system involvement is suspected, parental overdose with barbiturates or T-61 (Canada) is indicated.

## Equipment

A limited amount of equipment is necessary to perform a field necropsy. Sharp knives, a sharpening steel, bone cutting tools, a scalpel, forceps, sampling containers (for both gross and histological specimens), swabs, formalin boots, coveralls, gloves, labelling supplies and a notebook for recording are the necessary items. There are many types of knives which are available, including deboning, skinning, etc. The type to choose is best determined by individual preference and the job required. A sharpening steel is very useful to maintain a sharp knife edge, but it is important to properly sharpen your knives on a routine basis. Although a saw or rib cutters can be used to cut through bones, a light-weight, single bitted axe is cheaper and more convenient for most practitioners to use. A scalpel and forceps are preferred for collecting histological samples because smaller sections of tissue can be collected, thus ensuring adequate tissue fixation. Also, the structure of the tissue is only minimally altered by mechanical forces.

Sampling containers, swabs and formalin are commercially available. The most desirable containers for histologic samples are wide-mouth, shatterproof, clear plastic jars with lids that screw on tightly. These containers prevent breakage or leakage during transport and facilitate the removal of specimens from the container. Remember that the volume of fixative used should be at least ten times the volume of tissue. The containers of choice for microbiologic tissue samples are sterile, disposable transparent polyethylene Whirl-Pak® bags because they are liquid and air tight thus preventing leakage and cross contamination during transport. All fresh tissue samples should be kept cold to reduce autolysis and growth of saprophytic organisms. If swabs are used to collect specimens, the use of transport media helps to maintain the viability of fastidious organisms. The brand name offered commercially usually differs between geographic locations. Check with your regional pathology laboratory or nearest hospital to obtain more specific information.

### Technique

The veterinarian should obtain an accurate and complete history on the animal before beginning the necropsy. This should be followed by external examination of the carcass noting the brand, other identification, sex, body condition, approximate size, hair coat, abnormalities of posture or contour, and the appearance of the external orifices.

The animal is placed in left lateral recumbency to begin the procedure. In animals with abdominal distention, this can be facilitated by relieving the ruminal gas pressure via an incision in the left paralumbar fossa. If a rendering company is used for carcass disposal, care should be taken to cause minimal damage to the hide because it is one of the most valuable commodities to the renderer. A single, ventral median or paramedian incision from the mandibular symphysis to the anus provides ample access to the carcass with a minimal amount of damage to the hide. The hindlimb is reflected by incising through the subcutaneous tissues of the flank, the medial thigh muscles and the coxofemoral joint. While reflecting the hindlimb, the musculature can be examined for abscesses, areas of necrosis or areas of degeneration. In addition, the coxofemoral joint should be inspected for any signs of arthritis. Skinning further down the leg allows access to the stifle joint for similar examination. The inguinal region should be examined for evidence of edema which could be the result of bloat. The forelimb is reflected by incising through the axillary tissue and skinning back over the neck and abdomen, observing the subcutaneous tissue for any abnormalities such as cellulitis, hemorrhage or edema.

The tongue, pharynx and larynx are removed ventrally by dissecting along the medial side of each half of the mandible and severing the hyoid apparatus and the dorsal pharynx. Continuing to dissect through the muscles of the neck

and along the dorsal side of the esophagus to the thoracic inlet allows the trachea and esophagus to be removed intact. The neck muscles are examined for abnormalities during this process.

The abdominal cavity is opened by carefully cutting through the abdominal wall along the costal arch. Extending this incision along the dorsal and caudal aspects of the abdomen allows the body wall to be reflected ventrally and the abdomen can be scanned for any obvious abnormalities.

Penetration through the diaphragm near the xiphoid process allows the integrity of the negative pressure in the thoracic cavity to be subjectively assessed. The thoracic cavity is opened with an axe by cutting through the ribs approximately one-quarter of the way down the thoracic wall and splitting the sternum. Using a knife to cut through any remaining tissue, the rib cage is reflected and the thoracic cavity surveyed for obvious abnormalities.

Before proceeding further, the caudal vena cava should be identified and inspected for evidence of thrombosis from the liver. To remove the pluck from the thoracic cavity, the mediastinum is cut dorsally, the aorta and the esophagus severed caudally and the pericardium detached ventrally. Examination of the pluck begins by sectioning the tongue to examine the musculature for inflammatory or degenerative changes. The esophagus is opened longitudinally along its dorsal border, allowing it to be surveyed for lesions. The larynx and trachea are similarly opened and examined. Continuing down the trachea into the lung, the major bronchi and the smaller airways are identified and their status assessed. The pleura are surveyed for the presence of exudate. Surface and cross-sectional examinations of the lung are performed paying particular attention to the size, color and texture of the parenchyma and the edges of the caudal lobes. Any abnormalities should be categorized by the type of lesion (broncho, broncho-interstitial, interstitial, aspiration or embolic) and the distribution in the lung. The mediastinal and bronchial lymph nodes should be identified and examined. The pericardium is opened and evaluated for the presence of exudate. Noting the size and shape, the heart is cut cross-sectionally through the apical portion, and the thickness of the ventricular wall is assessed. The ratio of the left side to the right side is estimated at this time (ideally 3:1). Each ventricle is opened by cutting toward the base of the heart next to the interventricular septum. The valves and outflow paths are identified and abnormalities noted. The myocardium is assessed by sectioning it in several places, particularly over the papillary muscles.

Samples to be submitted for histologic, bacteriologic or virologic examination can be taken individually during the postmortem or as a group at the end. When collecting histologic samples from the lung, portions should be taken from each of the cranial, middle and caudal lobes of either the right or left lung. In addition, if a specific lesion is present in any organ, the histologic sample should originate

from the periphery of the lesion, thus ensuring that the surrounding tissue is represented by the submitted specimen. Also, due to the fact that most fixatives do not penetrate more than 3-4mm of tissue, portions submitted for histology should be 10mm or less in thickness. On the other hand, sections less than 3mm thick are also undesirable because they tend to curl during fixation. A scalpel and forceps should be used to aid in obtaining specimens of optimal size for fixation purposes. As the prosector moves from the thoracic cavity to the abdominal cavity, the diaphragm is examined for evidence of inflammation, necrosis or degenerative change. The liver is assessed according to its size, shape, cross-sectional appearance and the presence of abscesses or other abnormalities. Also, the gall bladder and its contents should be examined. The spleen is examined in a manner similar to the liver. The gastrointestinal tract is examined in sequence, from the forestomachs through the small and large intestine to the descending colon. The size, shape, position, appearance and contents of each should be evaluated as well as the appearance of the associated mesenteric lymph nodes. In addition, the mucosal surface should be examined paying particular attention to the Peyer's Patches in the terminal portion of the ileum. The components of the genitourinary tract (kidneys, ureters, bladder and proximal urethra) are dissected and inspected sequentially. The kidneys should be sectioned to examine the cortex and medulla. The patency of the urethra can be assessed by applying pressure to the bladder and noting urine flow. Cutting through the pubic bones with an axe allows a section of the pubis to be removed. This facilitates access to the caudal part of the peritoneal cavity and the anus, terminal rectum, vagina and distal urethra can be inspected. The status of the peritoneum should be assessed throughout the examination of the abdominal cavity and any abnormalities noted.

Returning to the head, the nasal cavity and the oral cavity, including the hard palate and buccal mucosa, are examined for the presence of erosions, ulcers, exudate, etc. The palatine tonsils, located in the tonsillar crypt on the lateral aspect of the dorsal part of the oropharynx, are found and examined. The eyes are inspected for lesions of the cornea or uvea. If the eyes are to be submitted for further diagnostic work up, they should be fixed in Bouin's solution.

There are a number of methods available for removing the brain from the cranial vault. Although most pathologists would argue that an axe is an inappropriate tool for accessing the brain, it can be used swiftly and very effectively if handled correctly. Two methods are related herein. One involves disarticulating the head at the atlantooccipital joint, concurrently inspecting it for lesions of arthritis, skinning the front of the head and sectioning it in half longitudinally. The other method involves removing the top

portion of the cranium by opening the cranial vault on a plane that passes just above the ear caudally and through the eye socket rostrally. Both methods are easily performed and deliver satisfactory access to the brain. After gaining entrance to the cranium, a knife is used to remove the brain. It should be cut in half longitudinally and one side sectioned and examined grossly for lesions. The remaining half can be submitted for histological examination, if it is necessary.

After completing the postmortem examination, the information collected should be accumulated and synthesized into a logical diagnosis. When it is necessary, histologic or microbiologic samples should be submitted to a diagnostic pathology laboratory for confirmation or followup. It is important to include a complete history with any submissions to assist the laboratory as much as possible. In addition, a necropsy form, outlining the findings of the examination and the diagnosis, should be completed and signed by the veterinarian.

The technique that has been described herein is for the performance of a complete necropsy examination. It is intuitive that when sufficient lesions have been identified to cause the death of the animal, the remainder of the carcass does not have to be examined in explicit detail. As a feedlot veterinarian, examination of the thoracic cavity, regardless of the cause of death, is a worthwhile exercise for it provides information important for the evaluation of preventive and therapeutic programs.

### Summary

The discussion of information pertaining to postmortem examinations presented in this paper should provide food animal practitioners with an efficient and practical means of performing field necropsies. Moreover, these examinations should provide valuable data for assessing the effectiveness of current preventive and therapeutic programs. This knowledge should assist the food animal veterinarian in the rational development of new strategies for the control and prevention of feedlot diseases.

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