Equine Field Necropsy

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Abstract

Performing a complete post-mortem examination in the field can be a daunting task for the equine practitioner. Systemic examination of the entire carcass comes with a variety of challenges that are not encountered when carrying out a "cosmetic" necropsy, during which only a certain anatomical structure, organ system or body cavity is assessed.

In cases where a complete post-mortem examination is requested or required and the client does not insist on burial of the horse on the premises, transportation to a diagnostic laboratory with an autopsy facility is preferable. This might be associated with additional costs and logistic challenges but offers several benefits. Referral is also the better choice whenever foul play is suspected or the carcass cannot be safely disposed on-site, or when the horse is insured for mortality and a post-mortem exam is required by the insurance.

However, in cases where a complete autopsy must be performed in the field, preparation and a systematic approach can lead to a very satisfactory result for veterinarian and client. These proceedings and the seminar will focus on the equipment needed for an equine autopsy and show attendees how to (1) choose the best location, (2) position the horse, (3) systemically examine the carcass, (4) document all findings and (5) appropriately collect and preserve samples.

Equipment

A sharp necropsy (deboning) knife and a sharpening steel, rib cutters (gardening shears) and a hand saw are the tools required for a full examination. During the necropsy, appropriate protective clothing, eyewear and rubber gloves should be worn. Formalin, sterile containers, scissors, forceps and a cold sterile kit complete the list of essential items. The ubiquitous cell phone with digital camera allows for excellent documentation of gross abnormalities.

Location

The ability to remove the carcass following the examination as well as biosecurity concerns determine where the necropsy should be performed. The ideal site for a field necropsy allows access for the equipment used to dispose of the remains, is removed from the housing of other horses on the property and has a surface that can easily be cleaned and disinfected, e.g. concrete. While the number of people involved needs to be limited, a full equine necropsy can be very demanding for a single veterinarian and help from an assistant should be welcomed.

Procedure

Similar to any surgical procedure, following a routine for setup, positioning and the dissection itself will enable the examining veterinarian to complete the necropsy in an efficient manner. A systematic approach also minimizes the risk of overlooking a certain structure during the exam. The following is a brief, step-by-step outline for a field necropsy. Tissue samples, no thicker than 0.5-1cm, are collected and preserved in 10% buffered formalin (10:1 formalin to tissue ratio). The samples should be representative of any lesions identified and have to be labeled accurately. Tissue from all organs should be collected, while microbiology or toxicology samples are acquired as needed.

The horse can be positioned in lateral or, if positioned against a wall or held in place by an assistant, in dorsal recumbency. The following text describes the procedure for a horse in lateral recumbency. Haircoat, skin, oral and nasal cavities, the perineal region, external genitalia and the eyes are examined and the BCS documented. The skin is incised at the uppermost axilla and the incision is extended cranially to the mandibular symphysis and caudally to the perineum, avoiding penetration of the underlying structures and cavities. Ex-articulating the coxofemoral joint and cutting the musculature that attaches the scapula to the thoracic wall allows for complete abduction of the upper front and hind limbs. Mammary glands or penis and testicles can now be examined.

The **abdomen** is opened by cutting the abdominal wall along the last rib (position the knife parallel to the skin to avoid puncture of abdominal viscera) and then dorsally along the transverse processes of the lumbar vertebrae until the pelvis is reached. After extending the incision towards the ventral midline, the freed abdominal wall can be flipped down, allowing access to the abdominal organs.

The diaphragm is now incised along its attachment to the rib cage, allowing the rib cutter to be inserted and to cut each rib at its dorsal and ventral extremity, opening the **thoracic cavity**. The ribs do not have to be cut ventrally, but can be forcefully reflected at the level of the costochondral junction. Using this technique, the chest wall can be reflected ventrally and can be used to close the thorax following completion of the exam. Slicing the rib just proximal to the costochondral junction allows collection of a wedge of metaphyseal bone with enclosed bone

3

marrow. After both major cavities have been opened, but before removal of any of the viscera, the best overall assessment of the organs can be completed, including position and appearance of the different parts of the gastrointestinal tract in horses that suffered from colic.

Following a thorough assessment in situ, the **gastrointestinal tract** is removed as a unit. The mesentery of the small colon and small intestine are cut close to their intestinal attachment (keep pancreas attached to duodenum) before the cecum and large colon are pulled over the back of the horse and their body wall attachments are digitally broken down. Cutting the esophagus and descending colon completes the removal. Now the different parts of the GI tract can be thoroughly assessed, including opening the lumen over sufficient lengths and collecting samples for histopathology.

Now the **liver** is removed, examined and samples are collected. The **adrenal glands**, located just craniomedial to the **kidneys**, are taken out together with their adjacent kidney. Transverse sections of the adrenal glands and tissue from the kidneys (from subcapsular cortex to pelvic lumen) are placed in formalin.

The **pelvic cavity** needs to be opened widely if the entire **urogenital tract** is to be assessed: the muscles ventral to the pelvis are cut away before the handsaw can be used to cut out the pubis. The urogenital system can now be dissected out.

Removal of the **cardiovascular system** ("the pluck") includes the cervical portions of the upper respiratory tract (larynx and trachea), the lungs and heart as well as the intimately attached upper gastrointestinal tract (tongue and cranial esophagus). Dissection starts by pulling the tongue ventrally between the rami of the mandible and then reflecting it caudally, cutting or bluntly breaking down the surrounding connective tissues as needed. This is continued all the way to the diaphragm. Aorta and vena cava are cut and "the pluck" is removed. The tongue, thyroid glands,

4

and lungs are visually inspected, palpated and sampled before esophagus and trachea are opened over their entire length, with the tracheal incisions extending into the mainstem bronchi. The heart is kept attached to the pulmonary system, the pericardium is opened and the heart is incised following the blood flow. The valves, musculature and the intima of the great vessels are examined systemically and at least one full section tissue sample should be submitted for further examination (left papillary muscle).

The difficulty of removing a **brain** often leads to the exclusion of its examination during a field necropsy. If clinical signs suggest an infectious (viral) neurologic disease, the necropsy examination should be completed at a laboratory to avoid exposure to potentially zoonotic diseases (rabies, virus encephalitides). For this purpose, the head can be removed from the carcass and submitted separately. In cases where infectious diseases are not a concern, the head is taken off and its dorsal musculature is removed before the calvarium is opened with a handsaw or cleaver. Using a handsaw, a transverse cut is made just behind the eye sockets, followed by two sagittal cuts that connect the corners of the transverse cut with the foramen magnum. The separated bone has to be pried open with a screwdriver or similar tool, but not the necropsy knife. The olfactory bulbs and cranial nerves are cut and the entire brain is removed and submitted to a laboratory for further analysis.

Examination of the entire **musculoskeletal system** is very challenging in the field, but a thorough assessment of an abnormal or suspicious area can be completed adequately. If sepsis or bacteremia are a concern in foals, several joints should be opened, examined and potentially cultured. It is recommended to open at least six joints in these cases, including one coxofemoral and one shoulder joint, as well as both stifles and hocks.

5

Documentation

A complete medical history should be acquired, necropsy findings need to be documented and collected tissue samples are submitted for analysis. A basic report should include number, size, shape, color and location of the lesions within each organ, as well as their consistency and texture (if possible). The percentage of an organ affected by a lesion is noted as well as a description of any fluid or material accumulations in cavities or spaces. Documentation of the lesions with a digital camera can be very helpful, especially when a ruler is available to demonstrate the size of an abnormal finding.

Summary

Although a field necropsy is a time-consuming and challenging task, it can be completed with minimal equipment and little assistance. Good preparation (site selection, setup and positioning of the carcass, sample container preparation), a well-structured dissection protocol and accurate documentation are critical for a successful post-mortem examination in the field.

Take Home Points

- 1. Transportation to a diagnostic laboratory with a necropsy facility is preferable.
- 2. A full field necropsy is a time-consuming task that needs to be carried out at an appropriate location, ideally with the help of an assistant.
- 3. Having a pre-packed "field necropsy kit" available ensures that all necessary equipment and instrumentation is available when a necropsy has to be performed.
- 4. Follow a well-structured dissection protocol.
- 5. Document your findings in written notes and with the help of a digital camera.

Suggested Reading

Frank, C., Madden, D. J., & Duncan, C. (2015). Field Necropsy of the Horse. *The Veterinary Clinics of North America. Equine Practice*, *31*(2), 233–245.

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