FEEDLOT EUTHANASIA AND NECROPSY

This section includes:

- Euthanasia overview as can be practiced in beef feedlots
- A necropsy outline for feeder cattle that minimizes detached organs

FEEDLOT EUTHANASIA

The principal reason for considering euthanasia in a beef feedlot is to stop pain and suffering of cattle that have little chance of recovery or of pain abatement. As veterinarians, we have an ethical obligation and responsibility to ensure cattle are treated humanely. When warranted, euthanasia, meaning a “good death,” must be considered.1,2

The feedlot’s veterinarian should help management develop euthanasia SOPs (Standard Operating Procedures) BMP (Best Management Practice) appropriate for the feedlot. This will serve as a guide for identifying situations for which euthanasia should be considered and a guide for selecting the method(s) appropriate for the feedlot’s safety concern. Additionally, the employee(s) training requirements should be listed and the employee(s) trained to administer the euthanasia technique must be

KEYWORDS

- Bovine
- Euthanasia
- Humane
- Brain stem disruption (pithing)
- Necropsy
- Diagnosis
- Records

KEY POINTS

- Safety of the person euthanizing an animal, and other people in the vicinity, are the most critical considerations.
- Attempt to connect all necropsy observations to a unifying diagnosis.
- Use a necropsy data recording system that allows for analysis of linked necropsy findings across all production management considerations on an operation, across operations and/or regions.
identified in the document. A copy of the euthanasia SOPs/BMP should be on file in the feedlot office. Euthanasia SOPs/BMP templates are available from the National Cattlemen’s Beef Association Beef Quality Assurance Program and from the American Association of Bovine Practitioners. These templates will provide a good starting place for developing a euthanasia SOPs/BMP that meets the needs of an individual feedlot. Important note: Cattle that will be rendered must not contain chemical residues that could be harmful to other animals that would consume rendered products. The Food and Drug Administration (FDA) Center for Veterinary Medicine (CVM) regulates all animal feeds and the agency has not expressed a concern about rendered by-product contamination from cattle treated with FDA-CVM approved antimicrobials or approved adjunct therapy medications.

**Conditions That Warrant Euthanasia Considerations**

The following is a list of conditions that warrant euthanasia considerations:

- Arthritis with multiple joints
- Central nervous system disorders
- Emaciation/dehydration
- Extreme lameness and reluctance to move
- Nonambulatory or unable to stand
- Peritonitis/pleuritis
- Pneumonia (unresponsive)
- Prolapsed uterus
- Ruptured bladder/uremia
- Septicemia/toxemia
- Severe anemia or jaundice
- Severe distress, for example following a severe injury
- Shock/imminent death
- Spinal injury
- Systemic neoplasia, extremely rare in feeder cattle

**Euthanasia Intent, Considerations, and Safety**

Although disagreement can arise about the method used to end an animal’s life, generally there is unified acceptance that if the animal is to die, it must be a “good” death in that the animal should be handled in such a way as to minimize excitement, discomfort, and/or anxiety before being euthanized. The euthanizing technique should cause humane rapid loss of consciousness and subsequent death without evidence of pain or distress, or use anesthesia produced by an agent that causes painless loss of consciousness and subsequent death.

The animal’s well-being and the safety of humans and other animals in the vicinity of where the animal(s) will be euthanized must be the primary considerations. The 4 “S’s” of safety must always be a primary concern. These are safety of yourself, safety of the animal, and safety of the food.

Esthetically, humans seem to have less personal anxiety with the use of injectable euthanizing techniques than with firearms or captive bolts. However, the use of injectable euthanasia agents is more apt to cause apprehension and mental distress in cattle to be euthanized. The application of these agents requires some restraint and pain associated with the injection needle placement, which increases the level of anxiety. Additionally, there can be significant and serious consequences to improper disposal of cattle euthanized with injectable agents. The FDA forbids the use of barbiturates in cattle that are rendered for concern the barbiturate might cause harm in animal foods.
that use rendered product. Cattle euthanized with barbiturates must be buried, burned, or composted. Anyone one of these disposal techniques may require either Environmental Protection Agency or state Department of Environmental Quality permitting. Environmental half-life of barbiturates and the potential for scavenging by wild carnivores, raptors, and dogs loose in the community could come to serious peril if the euthanized animal(s) is/are not properly buried, burned, or composted.\textsuperscript{1,2}

A potential alternative to barbiturate use in cattle would include the use of xylazine to induce deep sedation followed by an environmentally acceptable agent to disrupt vital organ function to cause quick death. Agents that are considered as the second injectable would include potassium chloride (KCl), magnesium sulfate (MgSO\textsubscript{4}) or a depolarizing muscle relaxant such as succinylcholine. NEVER USE ONE OF THESE AGENTS (KCl, MgSO\textsubscript{4}, or depolarizing muscle relaxants) TO CAUSE DEATH OF A CONSCIOUS ANIMAL! The same pragmatic statement might also be said of exsanguination. Unless the technique produces rapid exsanguination, such as at the skilled hands of a Rabbi, the animal should always be unconscious during the exsanguination procedure. Additionally, never use chemicals, such as quaternary ammonia, phenols, oxidizing agents, or other chemicals that have some other normal intended use that is not medical in nature.\textsuperscript{1,2}

Captive Bolt and Gunshot Considerations

In many situations, the cattle’s well-being would best be served if a firearm or captive bolt were used by a competent euthanasia technician to end the animal’s life. Generally, animals will not recognize the instrument (firearm or captive bolt) and loss of consciousness should be instantaneous with the triggering of the devise. The safety of the technician and bystanders is paramount. Captive bolts require close approximation to the animal, which in some situations would be a safety hazard. Firearms could minimize the proximity concern, but safety of bystanders might be a serious issue in some situations. Esthetically, the noise and visual associated with a firearm or captive bolt may not be appropriate for some situations, such as euthanasia of an injured animal in public settings.\textsuperscript{1,2}

A captive bolt can be dangerous to the operator if the targeted animal is not isolated, recumbent, and docile. An operator should never attempt to use a captive bolt on an animal when commingled within a group of cattle. Likewise, an operator should never attempt to use a captive bolt on an animal that is agitated until the animal can be brought under physical control. This is especially true in dealing with injured cattle remaining on a trailer.\textsuperscript{4}

Sedative/Tranquilizer Use

A pole syringe is an excellent tool for delivering a sedative/tranquilizer to agitated cattle to quiet them, allowing a safe approach with a captive bolt. A pole syringe can be constructed using a small-diameter telescoping painter’s pole that has had a washer attached to the end for accepting the black rubber seal from the plunger of a 60-mL disposable syringe. The painter’s pole with attached 60-mL syringe becomes a tool for delivering a sedative/tranquilizer to the bovine. Note it is best to use the largest injection needle available, such as a 14 gauge 1.5 inch. Additionally, it is useful to use the plastic syringe case with a needle-size hole punched in the end to cover the syringe and needle. This covering will help prevent the injection needle from bending (Fig. 1).\textsuperscript{4}

After the sedative takes effect, the animal can be safely approached with a captive bolt. The best sedative for this purpose is xylazine, as the effective dose for cattle is only a tenth the dose for other species, and it is denatured at 165°C and rendering temperatures are in excess of 240°C.\textsuperscript{7,8}
Gunshot as a euthanasia technique for cattle is acceptable provided the shooter is trained in gun safety and is a qualified marksperson with the gun to be used and at the distance required for euthanizing the selected animal.2–4 The first consideration, safety training should be conducted by an approved gun safety trainer. Typically there are classes offered in every community, and their times and locations can be obtained by contacting the local law enforcement office, university extension office, or gun store. From a liability standpoint, the feedlot’s management should not take for granted an employee who says he or she is trained in safe gun handling has been properly trained and should have procedures for verifying their training and testing their knowledge and skill. Management should identify a select few employees who will be assigned the responsibility of using a gun for euthanizing cattle in the feedlot and those employees must obtain updated gun safety training. The training must include the type of gun that will be used on the feedlot. A copy of the training certificate for each employee so assigned should be on file in the feedlot office.2,3

Gun selection should consider the ballistics of the cartridge to be used and the aiming stability over the distance/range required to deliver the bullet to the vital targeted area on the animal. At least 350 ft-lb of ballistic energy is recommended for feeder cattle between 450 and 800 pounds and at least 500 ft-lb of ballistic energy is
recommended for feeder cattle that weigh more than 800 pounds. Table 1 lists the energy ballistics for different caliber cartridges and notes that all large-caliber rifles, shotgun slugs, and most large-caliber handguns provide sufficient ballistic energy for euthanizing feeder cattle. When safety is included in the selection, the distance that a bullet travels from a large-caliber rifle cartridge generally removes large-caliber rifles from consideration. Unless the distance from the gun to the euthanasia target on a bovine is short, handgun aiming accuracy is difficult. When bullet distance traveled and aiming accuracy is considered, a shotgun rifled slug is often the best choice for feedlot euthanasia considerations (see Table 1).4

**Euthanasia Target Aiming**

Generally, the brain is the target for a captive bolt or gunshot. On rare instances, a gunshot to the heart may need to be considered, but the heart as a target for euthanasia should never be considered first as a primary location (Fig. 2).8 The landmarks for delivering a captive bolt stun or gunshot to the brain in cattle seem to be confusing. What one must know is the brain is above a line drawn across the animal’s forehead at the level just above the eyes (Fig. 3). The boundary for this line is the location of the zygomatic arch meeting the frontal crest, typically, three-fourths to 1 inch above the

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**Table 1**

<table>
<thead>
<tr>
<th>Cartridge Ballistic Energy</th>
<th>ft-lb</th>
</tr>
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<tr>
<td><strong>Ballistics</strong></td>
<td></td>
</tr>
<tr>
<td>Small Handgun &amp; Small Caliber Rifle</td>
<td></td>
</tr>
<tr>
<td>22 Magnum</td>
<td>360</td>
</tr>
<tr>
<td>22 Hornet</td>
<td>733</td>
</tr>
<tr>
<td>Handgun (FMJ unless otherwise noted)</td>
<td></td>
</tr>
<tr>
<td>9 MM</td>
<td>360</td>
</tr>
<tr>
<td>357 Magnum, SP (Soft Point)</td>
<td>537</td>
</tr>
<tr>
<td>40 SW (Smith &amp; Wesson)</td>
<td>400</td>
</tr>
<tr>
<td>44 Magnum</td>
<td>741</td>
</tr>
<tr>
<td>45 ACP (Automatic Colt Pistol)</td>
<td>404</td>
</tr>
<tr>
<td>45 Colt, LRN (Lead Round Nose)</td>
<td>410</td>
</tr>
<tr>
<td>Large Caliber Rifle</td>
<td></td>
</tr>
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<td>223 Remington</td>
<td>1099</td>
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<td>30-30 Winchester</td>
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</tr>
<tr>
<td>7.62x39 FMJ (Full Metal Jacket) - SKS (Savez Komunista Srbije)</td>
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</tr>
<tr>
<td>Shotgun Rifled Slugs</td>
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<td>16 Gage Rifled Slug, 2.75”</td>
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<tr>
<td>12 Gage Rifle Slug, 2.75”</td>
<td>2808</td>
</tr>
</tbody>
</table>

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*a Ballistics is the energy profile of ammunition measured in “Foot-Pounds” (ft-lb).
top of the eye. Note: This line is discussed later in this article as a landmark for brain removal during a necropsy. The location from both a front and side view is illustrated in Fig. 4. The tall, elongated pole on Holstein feeder cattle presents some targeting confusion, but as long as the lower brain landmark is considered, an effective gunshot or captive bolt placement is achieved.2,4

**Secondary Technique Used to Ensure Death**

Secondary techniques used to ensure death should be included following either captive bolt application or a gunshot.1,2 Exsanguination is used daily around the world as part of a sequence of techniques used to produce humane death of cattle intended for human food. Exsanguination is a reliable secondary technique to ensure death of animals euthanized by gunshot or captive bolt. Intra-abdominal exsanguination by cutting the descending aorta with a scalpel through the rectal wall might be a useful technique for large animals as the second part of a euthanizing process that starts with the use of a medication that renders the animal unconscious. *Veterinarians and laymen should never use exsanguination as the only euthanizing technique in conscious animals.* The use of intravenous KCL or MgSO4 as a secondary step after captive bolt or gunshot is also acceptable. However, both of these cause rapid blood coagulation; therefore, it can be difficult to get sufficient quantity to get the desired result.1,2

Brains stem disruption (BSD), using a rigid small-diameter rod, is the most reliable and simplest secondary technique I have used following a captive bolt or cranial
gunshot. It is far superior to any other secondary technique. The technique requires a small-diameter 15-inch length of stiff rod. A one-eighth-inch to one-quarter-inch welding filler rod works well. The rod is placed in the hole produced by the captive bolt or bullet and directed toward the foramen magnum (Fig. 5). There will be a slight stiffening of the animal’s legs as the rod reaches the brain stem.

**FEEDLOT NECROPSY**

When asked, “What is the purpose of a necropsy?” the answer is invariably, “To determine the cause of death.” In a feedlot generally, that is not the case. Most cattle that
die in feedlot settings have sufficient history and circumstantial information surrounding their death to, with some accuracy, predict the “cause of death.” I have 2 reasons for doing feedlot necropsies. First, it is a little like opening a Christmas present, you never know for sure what you are going to find. Second, and the principal reason for doing a necropsy, is to, with some accuracy, assign the animal cause of death to a management area in a feedlot. The management areas include cattle acquisition, arrival processing, sickness observation, treatment protocols, feed management, and facilities maintenance.

Each of management areas considered when doing a feedlot necropsy has sub-areas to consider. For example, cattle acquisition should consider source in terms of distance hauled, likelihood of cattle coming from herds in which a health management plan is followed, particular diseases common to an area (eg, flukes, parasite hypobiosis), and previous health issues from previous cattle from a source or geographic area. Examples for feed management may include subclinical acidosis, foreign bodies, particle size–associated bloat, and 3-methylindole–associated atypical interstitial pneumonia (AIP). Clinical AIP is a great example supporting the reason to do feedlot necropsies, as the syndrome can be related to feed management or a sequela from a previous pneumonia. Grossly, finding visual evidence of edema and emphysema along with evidence of a previous pneumonia, pushes this death into the health management group rather than the feed management group. Histologically, these are often diagnosed as alveolar or bronchial obstructions.

Because gaining information that may be used to evaluate production or influence production management decisions is key and because many production management issues are interrelated, doing a complete and thorough assessment of organ systems is critical to draw meaningful conclusions. My approach is one learned from the US Department of Agriculture Food Safety Inspection Service (FSIS). The FSIS abattoir inspection system focuses on inspecting organ system–associated lymph nodes (Fig. 6). If the lymph nodes draining a body system are normal, there typically is no reason to perform a detailed examination of the body system beyond a general visual

![Fig. 6. Bovine lymph node location diagram.](image-url)
overview. There are exceptions in which associated lymph nodes do not indicate the problem, such as the central nervous system (CNS), heart, lungs, and joints. Examining the lung-associated lymph nodes is extremely useful as an adjunct observation for assessing acuteness, activeness, and chronicity of other visual gross lung tissue observations. Another example is the tipoff provided by the hepatic lymph node that liver flukes may be present when black discoloration is observed.4

Necropsy Safety, Tools, and Technique

Safety is the first priority. Protective clothing, gloves, and boots that can be disinfected are a must. Remind everyone around to be careful to prevent or at least minimize their personal contamination. Adequate supplies should be present to adequately clean tools and equipment after the procedure.

Sharp Knives Are a Must!

A “V” carbide blade knife sharpener is a quick alternative to using a knife-sharpening abrasive. Although the edge is very course, it is a usable edge on a necropsy knife blade.

Sharpening knives

Diamond-coated steel slabs are more durable than stone abrasives. They are easily cleaned and having an assortment of different grits is useful. Holding the blade at a consistent angle during sharpening is critical. There are several diamond-coated sharpening abrasives designed to maintain a consistent sharpening angle. Most have a clamp to hold the knife blade and the abrasive is connected to a rod that slides through angle slots above and below the knife’s cutting edge. Round diamond-sharpening rods are very difficult to use, as it seems impossible to hold a consistent angle, and therefore more blades are wrecked than sharpened.4

Find a motorized knife sharpener! I strongly encourage having a motorized, high-quality diamond-coated, set-angle disc sharpener in your clinic. A 3-stage unit can be found at most department stores for less than $150. Each stage has a slightly different angle for the abrasives. The final stage in these is generally 5° wider, which provides increased durability to the cutting edge. Delegate the sharpening to a technician.4

Buy lots of knives and keep several sharp knives in your practice vehicle. When purchased in a 6-pack from a packing plant supplier, knives cost approximately 25% less than when purchased singly. Buy high-quality knives. Veterinarians find stiff blades from 6 to 8 inches in length are the best suited for cattle necropsies.4

Determining when the edge is sharp

A sharp cutting edge should be smooth and will grab or hold on to a plastic ink pen at a 45° angle when the blade is rested on the pen without sliding down the barrel. If it holds onto the plastic barrel, the cutting edge is sharp.

Finishing the cutting edge and keeping your knife sharp

A ceramic sharpening rod is the best tool found for honing a fine edge on a necropsy knife blade. When using a ceramic rod or metal steel, stroke the blade gently, feeling for defects in the cutting edge as the blade slides down the tool.4

Key to keeping your necropsy knife sharp

Beside knives, consider having a boy’s 2.25-lb axe, looping shears with extendable handles, utility knife and blades, and a cordless reciprocating saw fitted with a course heavy pruning blade (Fig. 7).
Do not use your necropsy knife for jobs that will damage its cutting edge. For example, I use a utility (box cutter or carpet) knife for skin incisions to avoid damaging the cutting edge of the necropsy knife on hide, hair, dirt, and/or mud. Additionally, I avoid damaging my necropsy knife blade by not using to cut plastic ID ear tags and cutting rib cartilages, unless the rib cartilages are in very young animals. A lopping shear, axe, or (my new favorite) cordless reciprocating saw saves the cutting edge of the knife.4

**Feedlot Necropsy Technique That Minimizes Loose Body Parts**

**Start with the ruminant on its left side**

Think about what you are observing and let the lymph nodes be your guide.4 The structure and function of the organ tissues can be key to linking observations to a meaningful diagnosis.9,10 Try to connect observations into a unifying diagnosis or production management observation.4 Be slow to jump to diagnostic conclusion based on your first observations and look at all body systems. The “lift a leg and look” or “peek-a-boo” necropsies generally leave important production management observation undiscovered and minimize the value of the observations that could have contributed to better animal care and management.

**Accessing the brain**

*Important note: rabies should be on the differential of all cattle suffering from CNS disease; therefore, protect yourself and bystanders from contamination. The rabies virus does not survive in dead animals beyond 24 hours when the carcass remains above 70°F.*11

Cuts through the calvaria with a short-handled axe are made approximately 1.5 cm above the lateral canthus across the forehead and from the lateral canthus dorsally over the pole (Fig. 8). Make sure the axe cuts are completely through the cranium. Use the blunt or hammer side of the single-bit axe to strike the cut edge of the cranium along the frontal crest at a 45° angle to break the calvarium away from the brain.

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**Fig. 7. Necropsy tools.**

**Fig. 8. Brain removal steps.**
Removing the brain is a 2-step process. Start by cutting the dura mater across the cerebral falx. The falx is the tough medial division of the dura (see Fig. 8). Extend this cut to allow your fingers to slide beneath the cerebrum. Next, cut between the cerebrum and the cerebellum at the level of the pons and lift the cerebrum out of the cranium. The second step requires splitting the dura mater covering the cerebellum dorsally. After the dura covering the cerebellum is cut, slide the tip of your necropsy knife behind the cerebellum into the spinal canal and cut across the spinal cord distal to the obex. Lift out the cerebellum and spinal cord containing the obex.

**Opening the hide and reflecting the legs**

Keeping the skin incision within a hands breath of the midline will improve the hide value to the rendering company. Therefore, avoid cutting the hide behind the front leg and in front of the back leg. I use a utility knife for all hide incisions. I avoid detaching any organs that are not required to be detached for examination. Detaching organs needlessly creates additional work for rendering company personnel and make a nasty job even harder. Additionally, not detaching organs makes it easier to remove the animal from the necropsy to disposal area with all its parts and is less likely to create a mess at the feedlot.

Using a utility knife, begin cutting along the underside of the jaw continuing over the larynx and down the neck over the trachea. Extend the incision toward the animal’s right foreleg axillary space and continue to cut the skin along the ventral thorax across the costochondral junctions, continuing along the abdominal wall toward the right rear inguinal area. The incision across the thorax and abdomen will be a few inches lateral to the midline (see Fig. 8).

*Reflect the rear leg before attempting to reflect the foreleg.* While reflecting the rear leg do not worry about finding the coxofemoral joint. When you cut the heavy muscles (adductor, semimembranosus, pectineus, and sartorius) that hold the coxofemoral joint in place, a sucking sound will be heard as the joint dislocates, exposing the round ligament. Cut the round ligament and examine the joint (Fig. 9).

To examine the stifle and hock joints, begin with the rear leg reflected. Skin along the inside of the leg from the stifle joint past the hock joint. Cut along the side of the stifle joint over the femoral trochlea. Next, cut above the patella through its quadriceps attachment down to the femur. Rotate the patella laterally over the condyles. This provides a great view of the stifle joint. To examine the hock joint, cut across the extensor muscles and use the distal bellies of the muscles as a handle for lifting up on the distal tendons as they cross the hock joint. Cut between the tendons and the tibia down to the hock joint. As the joint is approached, you should notice the hock joint capsule. Cut across the joint capsule to expose the joint. Because the tendons are lifting up on the capsule, it usually pops open allowing noncontaminated access for joint fluid collection.

Next, finish skinning the carcass back and reflect the foreleg. Begin by working from the back side and reflect the hide back as you work toward the front leg. As you get to the shoulder, the latissimus dorsi holding the foreleg down will be easily cut. Move to the sternal side of the animal and lift the foreleg, first cutting the pectoral muscles and continue to lift as you cut serratus ventralis muscles. The foreleg should lay over easily with only minor fascia dissection. This approach avoids cutting up the arm pit and lessening the value for the render.

**Examining the oral cavity and neck structures**

Cut the skin along the side of the cheek, exposing the cheek teeth. A great view of the oral cavity is provided, including an opportunity to examine the tongue, and allows for
examining molar eruption (Fig. 10). The first molar erupts in cattle at approximately 7 months of age and is in full wear at approximately 12 months.12 Because almost all feeder cattle are younger than 2 years when arriving at the necropsy area, if age information is useful, the molar eruption is the only clue available, as the incisors do not begin erupting until approximately 20 months of age.

Cut in front of the larynx and dissect the larynx, trachea, and esophagus away from the neck. Open the esophagus, larynx and trachea down to the level of the thoracic

Fig. 9. Reflecting the hind leg.

Fig. 10. View of cheek teeth.
inlet for examination. If a “bloat-line” observation is important in the necropsy, separate the esophagus from the trachea down to the thoracic inlet. Later, when the pluck is lifted over the first rib, the esophagus can be withdrawn through the thoracic inlet and its entire length can be examined.

**Opening the abdomen and thorax**

There are numerous ways to enter the abdomen. I incise the abdominal wall along the greater curvature of the last rib, being careful not to incise the intestine. Once I can get my hand inside the abdomen, I reverse the grip on my necropsy knife so the tip of the handle is forward and, with the knife point outside the abdomen, I slide my hand inside the abdomen with the knife handle leading the cutting edge and incise the abdominal wall as I advance my hand (Fig. 11). Continue until the abdominal wall is reflected. Tear the omentum out of the way, exposing the small intestines.

Using a shear, axe, or cordless reciprocating saw, cut across the distal ribs close to the costochondral junctions. The ribs may be separated and manually reflected by breaking the individual ribs back, dislocating the rib from the spine (Fig. 12). I leave the first rib intact so I can reflect the pluck over the rib and the rib will hold the pluck off the ground and keep it attached to the carcass, preventing the pluck from falling out as the necropsied animal is removed.

**Examining the thoracic cavity**

Examine the pericardial sac and fluid. To detach the puck, start by cutting between the thoracic vertebra and aorta. Then dissect the lungs free from the diaphragm. Cut across the aorta, vena cava, esophagus, and mediastinal reflections from the pericardial sac. Continue to free the pluck by cutting the pericardial sac loose from the sternum. Reflect the lungs by grasping the LEFT diaphragmatic lobe and lift the lungs and heart forward over the first rib (Fig. 13).

Palpate the lung, and examine the tracheobronchial lymph nodes and airways. The esophagus can be pulled through the thoracic inlet if a potential bloat line is of interest. There are multiple acceptable ways to examine the heart in feeder cattle. I examine the heart’s pericardium as I lift the heart. I cut across both ventricles of the heart half way between the apex and the coronary groove. This allow visualization of both heart valves and the left papillary muscles for evidence of necrosis often associated with
**Histophilus somni.** Open the remaining dorsal ventricles through the aorta and pulmonary artery. These steps are illustrated from left to right in Fig. 14.

**Examining the abdominal cavity**

Fan the small intestines out or spread over the rumen and closely examine the mesenteric lymph nodes (Fig. 15). Autolysis can make it pointless to open and examine the entire length of the intestine. Mesenteric lymph nodes usually retain their architecture longer than bowel and examination is useful. Take a look at the ileocecal valve for signs associated with salmonellosis.

When the small intestines are spread over the rumen, it is easy to examine the right kidney and liver. Next, flip the small intestine over the back, exposing the colon, bladder, and left kidney (see Fig. 15).

Make a small hole in the rumen behind the anterior pillars. Reach in and find the ruminoreticular fold. Pull the fold to the surface and examine the anterior wall of the ventral blind sac for acidosis lesions or scars.

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**Fig. 12.** Exposing the thorax by breaking the ribs back.

**Fig. 13.** Pulling the lung out of the thorax.
To reach the spleen, feel under the anteroventral edge of the abomasum next to the diaphragm. Palpate the reticulum for evidence of hardware disease. Open the abomasum to examine the surface for lesions, such as ulcers, parasites, or scarring.

**Recording Your Observations**

The principal purpose of feedlot necropsies is to gain information that evaluates or can provide clues that can influence production management decisions. Observations, beautifully written, generally get lost in a file drawer and are of little value in analyzing herd-level observations over time. A necropsy observations check-off form improves consistency of observations, especially if necropsies are performed by trained personnel, rather than the veterinarian (Fig. 16). A consistent set of digital photographs...
of each necropsy that includes the animal’s identification tag in each photo can be very valuable when communicating with the removed veterinarian, pathologist, or lawyer. The photos one may take include the surface and opened view of the lung with the tracheobronchial lymph node, heart, kidney, and the small intestine with an associated mesenteric lymph node.

The necropsy form described in a Microsoft Word format, as well as a Microsoft Access necropsy database, that allows necropsy report forms to be easily searched for...
relationships between cases and production management decisions, can be down-
loaded from the University of Nebraska–Lincoln, Great Plains Veterinary Educational
Center’s Internet site (http://GPVEC.UNL.EDU) see “Griffin’s Teaching Files” under
the “Students Resources” section.4,13

Final comment
From time to time, collecting samples and submitting them to your diagnostic labora-
tory will be appropriate. If the samples are not handled correctly, little additional infor-
mation can be gained. There are several references available.12–18 At the very least,
put you phone number and the laboratory’s phone number next to the addresses,
double bag all samples, twist the wires on wire-tie bags, include sufficient absorbent
to soak up all transported liquids, and place your paper work in a sealed plastic bag to
prevent it from getting wet if should there be a fluid leak.

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