

# Effective and efficient necropsy techniques

David B. Sjeklocha, DVM

Merck Animal Health Technical Services, Sublette, KS 67877; beefdoc@gmail.com

## Abstract

One of the major issues new graduates face is simply earning the confidence of their clients. Being able to conduct a necropsy efficiently and effectively is 1 way to gain the client's confidence. This article includes necropsy tips and techniques the author has developed over 25 years of beef cattle practice.

**Key words:** necropsy, knife, axe, sharpen

## Résumé

L'un des problèmes majeurs auxquels font face les nouveaux diplômés est tout simplement de gagner la confiance de leurs clients. De pouvoir faire une nécropsie efficacement est une manière de gagner cette confiance. Cet article propose des conseils sur des techniques de nécropsie que l'auteur a développées pendant 25 ans dans une pratique de bovins de boucherie.

## Introduction

The majority of cattle producers (beef or dairy) have observed multiple necropsies performed by competent veterinarians. When a new graduate veterinarian comes to the farm to do a necropsy, the livestock owner may have some reservations regarding the experience, qualifications, and diagnostic capabilities of the new graduate. All new graduates have experienced this type of skepticism early in their careers, whether it be for necropsies, pregnancy examinations, breeding soundness examinations, and so forth. When a client sees a veterinarian struggling to simply cut the skin on a subject, it doesn't give the client a high level of confidence in the veterinarian's talents.

## Tools

The author's basic tools include a 7" (18 cm) Eicher wide-blade straight knife (for cattle weighing ~400 lb [180 kg] or more), a 6" (15 cm) Eicher curved boning knife (for calves), a protective scabbard for each knife, a 2-sided sharpening stone (fine and coarse, should be at least 8" [20 cm] long), a medium steel (at least 12" [30 cm] long), a camper's axe (Estwing all-steel 4" [10 cm] with stainless steel blade; Figure 1), kitchen/cleaning gloves, and cut-resistant gloves (local meat locker can probably order these; Figure 2). Other tools that might be of value include a utility/carpet knife

with replaceable blades, and a cordless reciprocating saw (although one must have several batteries and keep them charged; Figure 3). The author is not recommending any brand name specifically, but some brands are listed so the reader can search online and find the exact tool the author is describing. Many veterinarians like Victorinox knives (black handle), some like Dexter or Flussel (white handle), and some like to use knives that have a replaceable blade (Havalon BRK Baracuta Quik-Change). The author has used Eicher knives for his entire career, and his current knife was purchased in 1998, after his necropsy kit was stolen from his truck. There are many other brands of knives available, so veterinarians should find a knife that suits them and use it.

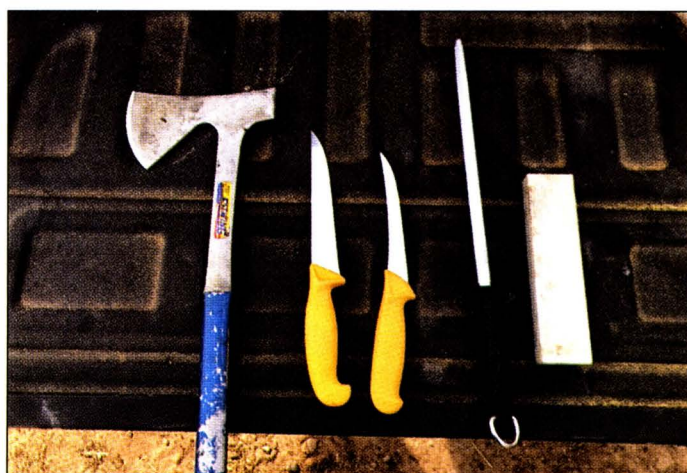


Figure 1. Dr. Sjeklocha's basic necropsy tools.



Figure 2. Kitchen glove and cut-resistant glove.

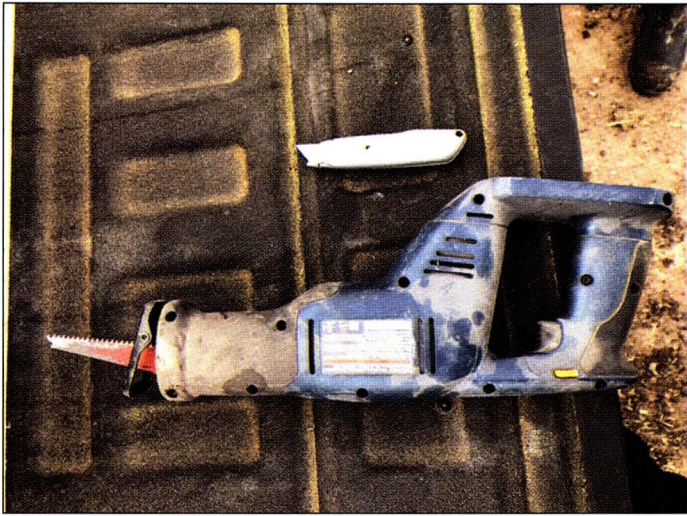


Figure 3. Reciprocating saw and utility knife.

### Sharpening

The importance of sharp cutting tools cannot be overstated. Sharp cutting tools are safer, and they make the job much easier. There are many YouTube videos on how to sharpen a knife. Most knives are reasonably sharp when they are purchased. The author seldom uses a sharpening stone (or whetstone) on his knives, because he stops frequently throughout the necropsy and strokes his knife on a steel. A steel and a sharpening stone are not interchangeable in their purposes. The sharpening stone does exactly what it sounds like – it sharpens the knife. But even with a sharp edge, a knife has what is commonly referred to as “teeth”. The steel is made for aligning those teeth. If a knife is dull, the steel is not going to help the knife’s edge to any noticeable degree. The knife will have to be taken to the stone first. There are several types of diamond sharpening instruments that are shaped like steels, but these instruments should be considered a stone, not a steel.

**Using a stone.** The author uses a double-sided (coarse and fine) sharpening stone, usually about 8” (20 cm) long, and uses the stone dry (i.e., does not use water or oil on the stone). Stones should probably be no less than 8” (20 cm) long for sharpening the typical necropsy knife. These stones do not have to be expensive – the stone that the author uses typically costs around \$12.00 at the local hardware store. Some stones are made to be wetted with water, and others may use a special honing oil. Some stones will be ruined if honing oil is used on them, so be sure to read the care instructions that may come with the stone. Holding the knife (or any cutting edge) at the correct angle relative to the sharpening stone is very important. The angle recommended by most knife experts is usually in the 15° to 30° range. Trying to maintain such an angle can be very difficult, especially if the person doing the sharpening lacks experience. The best advice that the author received came from Dr. Dee Griffin, who explained

that if the knife is held at an angle to “just shave the very top off of the stone,” the angle would take care of itself. Each stroke should go nearly the full length of the stone, and the full length of the knife blade. The blade should be stroked the same number of times on each side. If the knife is really dull, use the coarse side of the stone first, then finish on the fine side of the stone.

**Using a steel.** Once the knife has a good edge from the sharpening stone, it is time to align the knife edge with the steel. Again, there are several good YouTube videos that demonstrate how to use a steel. The steel should be held with the weak hand and the knife with the strong hand (i.e., right-handed people hold the knife in the right hand, the steel in the left) and the blade of the knife should be drawn against the steel for the full length of the knife and nearly the full length of the steel. Again, stroke each side of the knife the same number of times. There should not be a great deal of pressure applied as the knife is stroked over the steel. If the steel “jumps” as the knife comes off of it, then too much pressure is being applied. The author will make the ventral midline cut of the skin, and then use the steel on his knife. Then he will cut the subcutaneous fascia, reflect the skin back, cut the abdominal musculature, reflect it back, and use the steel again (4 to 5 strokes on each side of the blade). The author uses a medium grade steel, as fine steels wear out quickly, and the edge put on a necropsy knife by a fine steel doesn’t seem to last as long as the medium steel edge. Steels do wear out, so if a steel has been used a few years and isn’t providing the edge it once did, a new steel should be purchased.

**Gadgets.** There are many sharpening gadgets available. Some may work well, but most of the gadgets that the author has seen have a short life. Also, most veterinarians that use sharpening gadgets seem to be constantly looking for the next new gadget, indicating that there is never true satisfaction with them.

### Necropsy

Every necropsy should begin with acquiring a history on the animal, followed by a close examination of the carcass as it lays. To begin, the animal should be laying with its left side down. Keep in mind that the hide is one of the most valuable products for the renderer, so if the animal is to be rendered, please avoid making unnecessary holes in the hide. The author makes the first skin cut starting paramedian to the midline, near the umbilicus. The incision continues anterior between the forelegs, all the way to the mandibular symphysis. The knife is held so the cut is made subcutaneously (under the skin, so the knife is cutting only through the skin, and not the hair). If the hide of the animal is excessively muddy, this cut might be best made with a utility/carpet knife to save the blade on the primary knife. The skin is then incised caudally to approximately the level of the flank or stifle. The right foreleg is then placed on the prosector’s left shoulder while the skin and foreleg are reflected. Once this

is complete, the skin incision is extended caudally between the hind legs. The prosector can lift the right hindleg with the left hand and make the cut through the skin and musculature of the hindquarter. The right foot of the prosector can be placed on the left hindleg while lifting on the right hindleg. The cut can then be deepened into the musculature to the coxofemoral joint, which can then be disarticulated. The right hindleg can be fully reflected at this point, and the prosector can then undermine and reflect the skin over the flank area. At this point, the author will stop and stroke his knife on the steel. A cut is then made through the abdominal musculature along the caudal edge of the rib cage, along the ventral midline and along the transverse processes of the spine. This musculature can then be reflected caudally so the abdominal organs can be observed.

Next, the oral cavity, trachea and esophagus can be examined. The author will make a stab incision from the ventral side of the right mandible, near the mandibular symphysis. This stab incision will extend past the lingual surface of the mandible on into the oral cavity. Then the incision will extend caudally along the lingual surface of the right mandible. The knife is laid aside while the prosector reaches into this incision, grasps the tongue, and rolls it ventrally out of the oral cavity. The tongue can be examined at this point. The author will then make a stab incision through the tongue to create a handle with which to grasp the tongue. Then, one can finish cutting the tongue loose by incising along the left mandible's lingual surface. Once the tongue is free, the cartilaginous joints of the hyoid apparatus can be palpated and incised. At this point, the tongue can be grasped and while putting slight tension on the tongue, the esophagus and trachea can be cut free to the level of the thoracic inlet. The esophagus can be incised caudally from the level of the pharynx and examined. Then, the trachea can be incised caudally from the larynx and examined. If the prosector needs to examine the teeth of the animal, an incision through the skin on the buccal surface of the right mandible can be made, and the skin can be reflected caudo-dorsally.

The ribcage can then be opened. The author uses an axe to open the ribcage. With the axe, the ribs are cut starting at the caudal edge of the rib cage near the spine and cutting anteriorly. Ribs are a protective structure for the thoracic organs, so they can absorb shock. This is why it is important to make the cut within a few inches of the spine, because further away from the spine allows for much more flex in the rib bones, and the axe is not nearly as effective. It is also important that the axe strike the rib at an angle that allows the cut to begin on the caudal aspect of each rib and cut through to the anterior aspect of each rib, as opposed to cutting from the lateral edge of each bone to the medial surface. The next cut is made at the anterior end of the costo-chondral junction and extended caudally. The knife can then be used to cut a 6 to 8" (15 to 20 cm) hole between 2 of the more caudal ribs. The left hand can be inserted into this hole and the ribs can be lifted while the diaphragm is cut free. The ribs can then

be reflected anteriorly, exposing the thoracic organs. Since the axe is used to cut bone, the bit of the axe head takes a great deal of abuse. The author does sharpen his axe with a stone after every necropsy, and then uses the steel on it. If the prosector is not comfortable using the axe, other methods and tools for cutting the ribs may be employed.

One popular method is to simply use the necropsy knife to cut through the costochondral junction, then cut between each rib or between every 2 ribs for the full length of the ribs, and lift and twist on each rib as it is disarticulated dorsally. Another common method is to use costotomes (tree pruner), which can cut the ribs fairly quickly and can also be used to cut the costochondral junction (or a knife can be used to cut the costochondral junction). The ribcage can then be reflected anteriorly, similar to the method described in using the axe. Some veterinarians use a cordless reciprocating saw for opening the ribcage, following the same cut lines that were described using the axe. Once the ribcage is reflected, the prosector can use the pleural surface to store any specimens to be sent in to the diagnostic lab.

Since the ribcage is open, the lungs and heart can be examined. To examine the left lung, the mediastinum will have to be cut along the spine, diaphragm and sternum. The esophagus will also have to be cut, which may result in rumen contents pouring into the thoracic cavity, especially if the rumen has any gas pressure. The prosector may want to expose the rumen and make a cut in the rumen wall to release any pressure or excess fluid before the esophagus is severed. Then the lungs can be reflected anteriorly to expose the left lung. The heart can also be examined, either before the lungs are reflected or after. The author will cut across both ventricles, near the apex of the heart. This will expose the ventricular cavities, and cuts can then be made through the ventricles for examination (myocarditis, valvular pathology, etc.).

Abdominal organs can then be examined. The author prefers to expose both the rumen and abomasum and lay them in such a way as to hang outside of the abdomen, so when these organs are opened, their contents can drain on the ground as opposed to in the abdominal cavity. The contents of both of these organs should be examined, as well as the integrity of the abomasal mucosa and the rumen papillae. Longitudinal incisions in several sections of the small and large intestines should be made, and the contents and mucosal surfaces of those organs should be examined, as well. The liver should be incised in several locations to check for lesions, such as abscesses and necrosis. Both kidneys should also be examined in a similar manner. The urinary bladder and uterus (if female) should also be examined.

If the brain is to be examined, the author will use the axe to open the skull. First, a cut is made from the lateral canthus of the right eye to the lateral canthus of the left eye. Then, a cut is made from the lateral canthus of the right eye dorsally, past the anterior edge of the base of the ear, continuing caudal to the poll and ending near the base of the left ear. The butt of the axe can then be used to tap along the cut edge of the skull,

which will expose the brain for easy removal and examination. Keep in mind, many rendering services will not pick up a carcass that has had its brain removed, due to concerns of rabies and BSE. The veterinarian may be required to sign a statement that indicates the animal is not a rabies or BSE suspect. If a saw is used to open the skull, cuts can be made in the same locations as described for the axe. Another method of brain removal is to remove the skull from the carcass at the level of the atlanto-occipital joint, then drill a hole in the skull through the frontal sinus just large enough for a garden hose to fit. Then water can be introduced into the cranial cavity, and the brain can be flushed out the atlanto-occipital opening.

The author will typically leave all organs intact (attached to the carcass), except when specimens must be collected for further diagnostics or imaging. This will allow for the carcass to be closed up and very few, if any, organs will fall out when the carcass is moved for disposal, such as when the rendering service arrives for pick up. If imaging an organ, make sure the organ is removed and has a background that

is starkly contrasting. Examples would be to lay the organ on the ground or perhaps the haired side of the hide, and then take the image.

### Summary

All recent graduates struggle with earning client confidence from time to time. Being able to conduct an efficient and effective necropsy is an excellent way to remedy this situation. Sharp cutting tools for necropsy not only makes the job less tiring, but also much safer. It is also important to establish a system or routine in conducting a necropsy, to assure that the necropsy is complete each time. Recent graduates can be assured that they have gained a client's confidence if the client pulls out their pocketknife and asks them to "...put an edge on here like you have on your knife."