A Method For Removing Brains From Ruminant Heads at Field Necropsies

Rue Jenson, D.V.M.
Robert Pierson, D.V.M.
Stuart Young, MRCVS, Ph.D.
Colorado State University

Steps taken in this procedure have the purpose of adequately exposing the brain, and removing it without damage, for futher examination. The procedure can be efficiently applied with only a few instruments, and can be accomplished in a field necropsy in less than 15 minutes.

1. *Detachment of tongue and larynx.* Make a mid-ventral incision of the neck and between the mandibles. Reflect the skin bilaterally. On the inner (medial) aspect of each mandible, cut through muscle and mucosa to detach the tongue. Reflect the tongue. Feel for and cut through the joint of hyoid bone articulations on each side of the tongue's root. Cut through the roof of the pharynx and reflect tongue, largynx and upper esophagus backwards.
2. *Removal of the head.* Forcefully extend the head. Cut vertically down through muscles ventral to the atlanto-occipital joint and through the joint capsule. Expose the cervical spinal cord and sever it transversely. Continue cuts through skin and muscles lateral and dorsal to the joint until the head is separated.

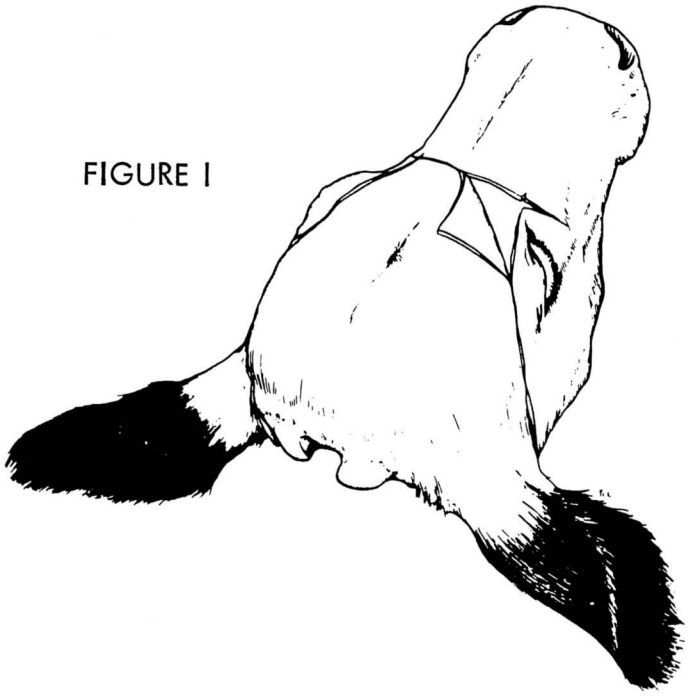


FIGURE 1

3. *Skinning the head.* Set the head down with lower jaws on a flat floor. Incise the skin across the face immediately anterior to the eyes. On each side, extend incisions posteriorly above the eyelids and below the ears, to points below occipital condyles. Remove circumscribed skin and ears from the bones of the skull (Figure 1).

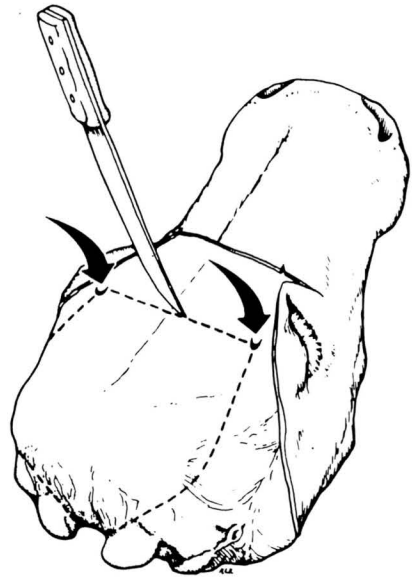


FIGURE 2

4. *Detachment of the calvarium.* Three major lines are marked roughly with a knife (Figure 2) for guides in use of a large cleaver, axe or saw: -
   a) transversely through the two supraorbital foramena (representing the anterior limit of the cranial cavity).
   b) from inner aspect of one occipital condyle to the supraorbital foramen on the same side, passing below the horn. This line is an arc over the lateral aspect of the cranial cavity. (Large horns should be removed previously).
   c) along a similar line from the other occipital condyle to supraorbital foramen as an arc on the other lateral aspect of the cranial cavity.

In chopping or sawing cranial bones along these lines, place the head down on one lateral side with the nose toward you. First saw or chop deeply into (but NOT through) occipital bone from foramen magnum to occipital crest until you feel the bone crack. Rotate the head so that the nose is away from you, and continue to cut or chop along the same line anteriorly, going deepest over frontal sinus. Repeat these steps on the other side of

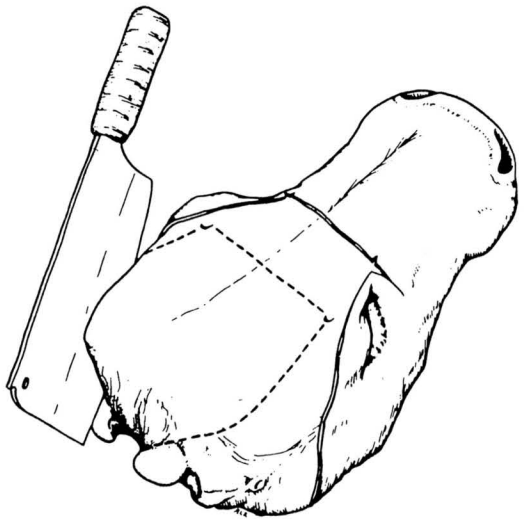


FIGURE 3

the skull, with head lying on its contralateral side (Figure 3). Finally, place the head in ventral recumbency, and cut or chop the transverse line which transects the two lateral lines at the level of supraorbital foramena.

Insert the edge of the cleaver below the calvarium at the front and, by leverage, pry it upwards and backwards until it is free, exposing the thick cranial dura

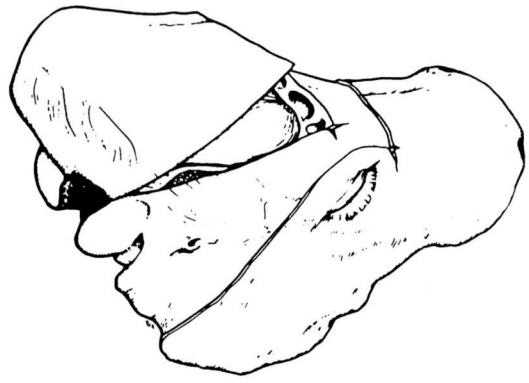


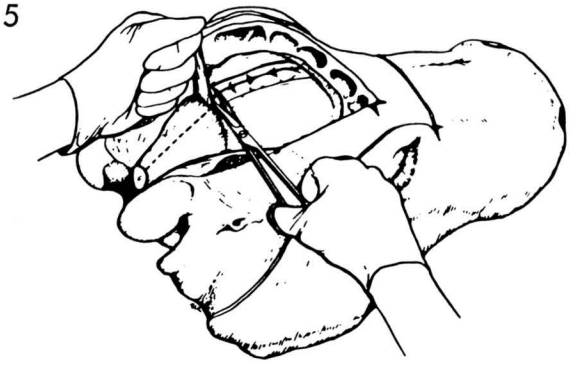
FIGURE 4

mater overlying the intact brain (Figure 4).

5. *Removal of the cranial dura mater.* Incise the thick dura mater transversely across the frontal poles of the brain with a clean sharp knife or scissors. Cut through and remove the dura from the surfaces of the cerebral hemispheres. Incise the falx cerebri between the hemispheres at the front and reflect it backwards to the point of its attachment to the tentorium cerebelli, which is a tough sheet of dura mater which lies transversely between cerebellum and posterior poles of cerebral hemispheres (Figure 5). Carefully cut through the tentorium sagittally, continue the cut through the dura which overlies the cerebellum and medulla, and remove all from the surface of the brain (Figure 6).

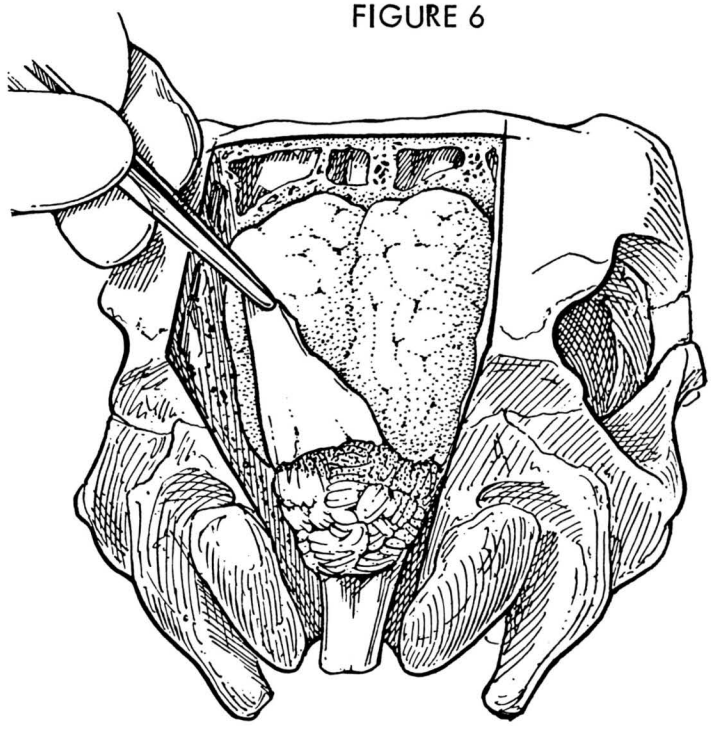
5. *Removal of the brain.* Avoid touching, compressing or contaminating the brain's surfaces during removal. Grasp the muzzle and, by manipulating it gently, control the release of the brain as its cranial nerves are cut so that it may be delivered upside down on to a clean, moist towel.

FIGURE 5



Start by cutting the olfactory tubercles at the front (Figure 7), then sever the optic nerves and pituitary stalk. Other cranial nerves can be cleanly incised on each side of the brain stem, tilting the muzzle upwards so that the brain is finally released by gravity-pull from the cranial cavity (Figure 8).

FIGURE 6



7. *Gross examination of the brain.* Examine size, shape and surfaces of all parts of the brain as it lies on a clean, moist towel. Avoid manual pressure, manipulation and unecessary incisions. Meningeal exudates, focal infarcts or abscesses, asymmetries and disproportions, and evidence of diffuse swelling should be noted.

8. *Additional tissues.* When an infectious encephalitis (eg

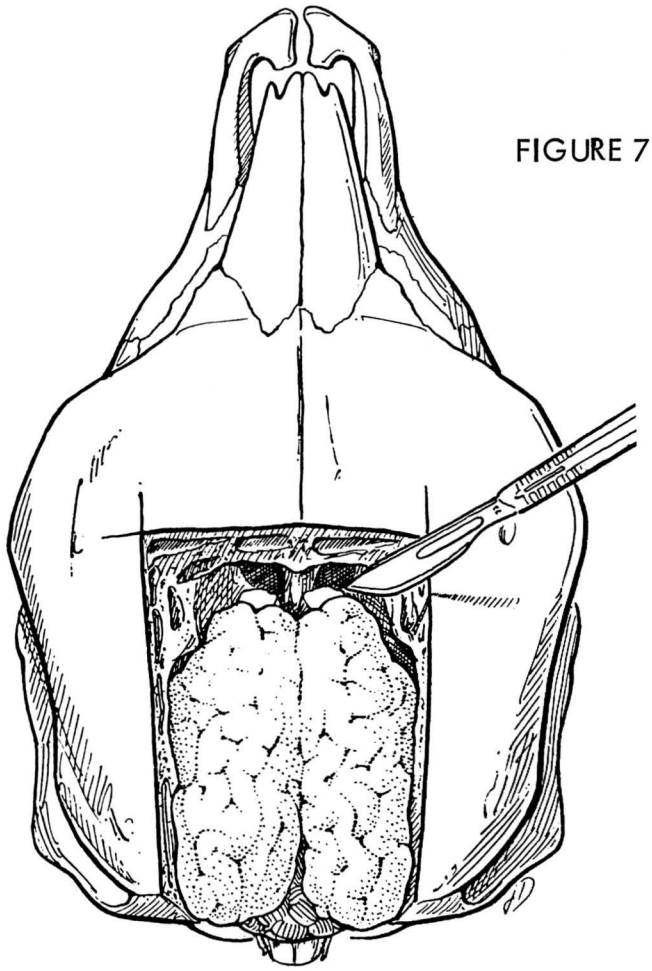


FIGURE 7

rabies) is suspected, a block of tissue which includes both trigeminal nerves and ganglia, pituitary gland and intracranial vascular rete should be removed from the cranial floor for laboratory examination (See Figure 9).

9. *Submission of specimens to a Diagnostic Laboratory.* Divide the brain sagittally into equal halves. Place one half in a wide-mouth jar containing 10 times the brain volume of 10% formalin solution (1 part commercial formaldehyde with 9 parts tap water). Place the other half in a plastic bag and pack with refrigerant. Submit to the laboratory with date and record of necropsy findings, animal identification and clinical history. (NOTE: If submission is by mail, bus, etc., the formalin-immersed half brain my be held in adequate volume of fixative for a few days, and then transferred to a double plastic bag containing a small volume of formalin for light weight packaging.).

FIGURE 8

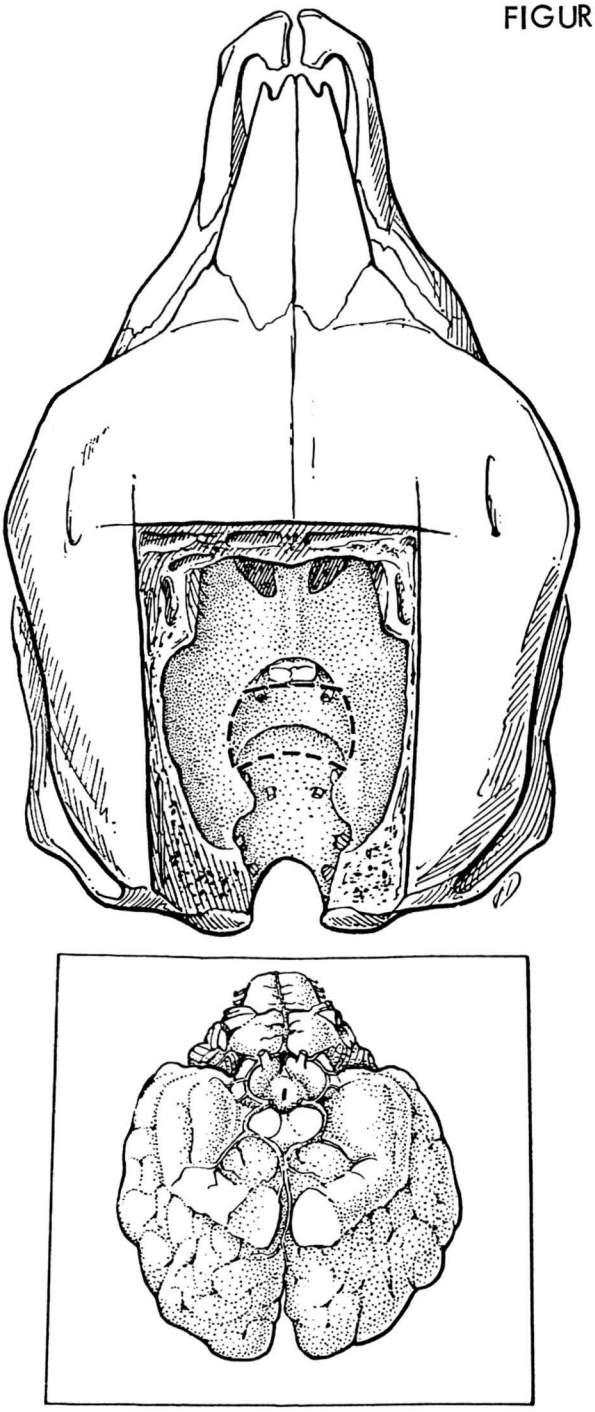
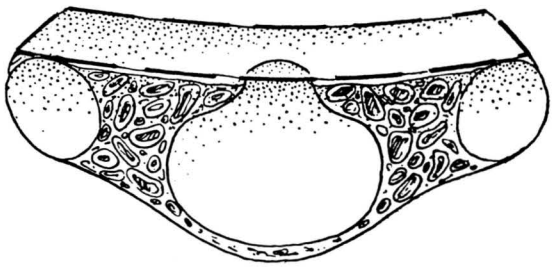


FIGURE 9



Bovine Neurological Problems

Comments During the Questions & Answers Session

Polioencephalomalacia ("polio") may occur in adults but is more common in calves, yearlings and 2 year olds.

The average response to treatment is about 50%. Feedlot lambs with "polio" are usually in lateral recumbency whereas cattle are in sternal recumbency and later in the lateral position.

Wood's lamp is useful in the examination of the brain on necropsy. It will demonstrate the presence of fluorescent materials which are associated with many types of neuronal necrosis and "polio" is one of them. In a dark room it will show the fluorescent rather greenish yellow color of the areas of the cortex which are necrotic and will be consistent with an animal having shown clinical signs for a few days. The lamp is more suitable for use by the pathologist than the clinician.

Necrosis of the cerebral cortex and brain swelling is also present in lead and mercury poisoning and these would also give positive wood's lamp results.

Thromboembolic mening oencephalitis (TEME) is mainly a winter disease and occurs in certain years, especially when characterized by severe break in the weather. The disease usually occurs as a clinical outbreak of respiratory disorder followed in about 3 weeks by CNS signs, whereas there are no lesions in the eye of cattle affected with polio (the blindness is central in origin), lesions are often present in TEME in the form of a fibrinous exudate in the anterio chamber. TEME is a septicemic disorder which arises from a widespread infection in cattle with *H. Somnus.* Numerous rusty-bronw spots (infarcts) are scattered at random throughout the brain—rarely a single large lesion in one area of the brain. There may be fibros polyarthritis or tendonitis but the joints are not so enlarged as with other polyarthrites. The kidneys are usually involved and in carrier animals they may not shed the organism in the urine and infect other animals.

Listeriosis is usually characterized by a body temperature elevation, circling, unilateral facial paralysis and loss of equilibrium. More common in winter when fed silage, but cases seen in summer. The causative bacteria reach the CNS by way of the peripheral nerves (this also occurs in leprosy, the only two bacteriological diseases in which disorders of the CNS are caused by bacterial invasion via the peripheral nerves). The bacteria gain entry through abrasions in the mouth, muzzle or tongue and travel via the 5th and 7th cranial nerves so lesions are found in the caudal brain stem because of the distribution of the roots of the 5th, 7th and 10th cranial nerves. It is therefore essential to remove all the brain, including the brain stem to send for laboratory diagnosis. Listeriosis is characterized by microabscesses with organisms and also non-suppurative encephalitis with mononuclear cell cuffs around vessels of the brain stem. Since the organisms are intracytologic, the tissue must be ground up to release them from the cells in order to be able to stain them successfully.

Atypical cases of pseudo rabies may die after showing circling signs and no pruritis in the early stages of an outbreak and are thus confused with listeriosis.

Otitis media cases are very common in feedlots, usually within 30 days of arrival. They are commonly associated with respiratory infection with spread via the eustachian tube, others may result from the use of a sprinkler system to control dust, others are due to ticks or dips.

The speakers had not encountered cases in which lesions were confined to the spinal cord.