

University of Idaho
Animal Care and Use Committee
Standard Operating Procedure (SOP)

Title: Ruminant Anesthesia

Species: Ruminants

Last Updated: 3/2/2006

Purpose

Anesthesia is used for restraint of fractious animals and to prevent unnecessary pain and suffering. Local, regional, or systemic anesthesia may be combined with sedation as described in SOP "Ruminant Sedation and Analgesia", and is required if surgical procedures will be performed.

Potential Impact on Animals

Inappropriate use of anesthetic agents may depress the cardiovascular and respiratory systems resulting in multiple system organ failure and death. Allergic reactions to anesthetics also occasionally occur. Generally, local or regional anesthesia is safer than systemic anesthetic procedures because cardiopulmonary function is not as compromised. Local anesthetics burn when injected, with resolution of the burn in seconds. The operator must always test the region to be manipulated by poking it with a sharp object (sterile needle, end of sterile surgical blade) to determine if analgesia is present before starting the painful procedure.

Procedure Description

LOCAL ANESTHESIA

Local anesthesia alone is useful when placing intravenous catheters, or when combined with sedatives and analgesics may facilitate invasive surgical procedures. Local anesthesia is achieved by rubbing on a topical anesthetic on the skin surface or injecting an anesthetic solution directly into the tissues to be manipulated. Topical and injectable anesthesia may be combined. Local anesthetics are normally applied after the site to be manipulated has had the hair removed and a surgical scrub performed. A final scrub is applied following the application of anesthetic. Topical anesthetics are gels that must be applied with an applicator or a gloved hand and require 10-30 minutes to take effect.

Injections must be performed aseptically using a needle of an appropriate size for the size of the animal. The needle is introduced at the site of manipulation and advanced forward while injecting anesthetic solution so that the anesthetic solution is dispersed in the tissues ahead of the needle as it is introduced. Only enough anesthetic to cause a slight bleb in the tissues needs to be injected in any one site. Additional coverage may be obtained by withdrawing the needle so that it almost but incompletely comes out of the animal, redirecting the needle, and then advancing the needle in a new direction injecting as the needle goes in. DO NOT move the needle back and forth sideways while deeply in the tissues to redirect it as this will cause subcutaneous or intramuscular lacerations and significant discomfort. A longer needle reduces the number of times the needle must be reintroduced through the skin, which is the most objectionable part of the procedure to the animal.

REGIONAL ANESTHESIA

Regional anesthesia is performed by anesthetizing the nerves innervating the tissues to be manipulated. This may be accomplished using several different types of blocks - line blocks, 7 block (when used on the animal's right side), reverse 7 (when used on the animal's left side, also known as inverted L) where the 7 describes the shape of the line of anesthetic), or individual nerve blocks such as paravertebral blocks. Individual nerve blocks require greater skill and are not used as often, but can reduce the amount of anesthetic that needs to be used. Nerves lay in a craniodorsal (towards the head and back) to caudoventral (towards the tail and feet) direction. Regional blocks must account for all nerves that may innervate the areas to be manipulated.

BLOCKS

A *line block* is performed by injecting a local anesthetic solution into the skin, subcutaneous tissues, and muscles along the incision line. The needle should be introduced parallel to the desired line of anesthetic placement, injecting as the needle is advanced forwards to reduce pain from the needle traversing the tissues. Once the maximum depth of the needle is reached, the needle is withdrawn. To extend the line block further reintroduce the needle into the area at the end of the already blocked tissues in the desired direction of the extension and proceed as described for the initial injection. Repeat as necessary to achieve the desired length of the block. Line blocks may be used anywhere but have the disadvantage of anesthetic distorting the area to be manipulated which may cause difficulty in closing incision lines and delay wound healing. In some procedures this tissue distortion may be unacceptable. Line blocks require 10-15 minutes to take effect.

A *reverse 7 block* is used for left flank laparotomy or any procedure on the left side of the animal. For a laparotomy, anesthetic is injected as described for a line block along the entire length of the caudal surface of the last rib and extends caudally at the level of the transverse processes of the vertebrae to the L4-L5 lumbar space. Anesthetic should be placed in the skin, muscle, and peritoneum.

A *7 block* is used for right flank laparotomy. The pattern of injection is the same as described for a reverse 7 block, except that a 7 is formed rather than reverse 7.

A *paravertebral block* is performed by injecting anesthetic at each nerve. An 18 gauge, 4.0 inch needle is required. A 12 gauge, 0.5 inch needle can be used as a cannula in the skin. The nerves to block for paralumbar fossa anesthesia are T13, L1, and L2. In an adult bovine, the needle is introduced 2 inches lateral to the spinous process and off the anterior edge of the transverse process of L1, off the posterior edge of the transverse process of L1, and off the poster edge of the transverse process of L2. If the incision site is in the posterior paralumbar fossa, L3 should also be anesthetized in a manner similarly to L2. The needle is walked off the edge of the transverse process at each injection site and then inserted 0.5 inches deeper to pierce the intertransverse fascia. In the adult bovine, the ventral branch of the nerve is blocked with 5-10 ml of anesthetic. The needle is then withdrawn approximately 1 inch and another 5 ml of anesthetic is injected to block the dorsal branch. Failure to block a dorsal branch is identified by sensitivity in the dorsal half of the paralumbar fossa. Failure to block a ventral branch is identified by sensitivity in the ventral to mid paralumbar fossa.

DRUGS

2% (20 mg/ml) Lidocaine (Xylocaine[®], Lignocaine[®])

Note – most commercial solutions contain 0.01 mg/ml epinephrine, which constricts local blood vessels prolonging the anesthetic effect; products containing epinephrine should not be used intravenously

Mechanism of Action – affects sodium channel depolarization/repolarization; metabolized in the liver and excreted in the urine

Dosage

Bovine – varies with size of area to be blocked; adult animals tolerate 100-125 ml total volume without difficulty

Sheep – 50 ml is the adult maximum dose that may be administered at one time; sheep are highly sensitive to lidocaine induced seizures; toxicity can occur at lower doses if administered directly into the blood stream or highly vascularized tissues

Duration of Anesthesia – varies with species, but effects generally last 30-45 minutes

Reversal Agents – none; warming the area to increase circulation may hasten in recovery; a short-acting may be administered therapeutically to control seizures if they occur

Withdrawal Time – meat – none; milk - unspecified

GENERAL ANESTHESIA

General anesthesia in ruminants requires withdrawal of food for 24-48 hours prior to anesthesia and withdrawal of water for 12-24 hours prior to anesthesia to reduce the likelihood of aspiration of rumen contents. Once anesthetized the head should remain lower than the neck, the mouth flushed with water to remove ingesta, and an endotracheal tube placed.

Injectable general anesthetics as sole agents are not well developed for ruminants. Chloral hydrate is a moderate sedative but has poor analgesic effects. Ketamine provides excellent restraint, but muscles remain rigid and there is poor visceral analgesia. As a result, injectable general anesthesia is usually a combination of products.

Inhalant anesthetics (halothane, isoflurane) are the safest choice for general anesthesia, but are more expensive and require a precision vaporizer, closer anesthetic monitoring, and more skill on the part of the anesthetist.

Guafenesin / Ketamine / Xylazine Drip (GKX)

Sheep & Goats

Dosage - 50 mg/ml guaifenesin, 2 mg/ml ketamine, 0.1 μ /ml xylazine intravenous drip at 1.5-2 ml/kg/hr

Duration of Anesthesia – 1-1.5 hours or longer

Withdrawal – no defined times are available; use in food animals requires a valid extralabel prescription by a licensed veterinarian or a valid INAD

References

1. Veterinary Anesthesia. WV Lumb & EW Jones. Lea & Febiger. 1984.
2. Large Animal Anesthesia Principles and Techniques. TW Riebold, DO Goble, and DR Geiser. The Iowa State University Press. 1982.
3. Veterinary Anesthesia, Baltimore, Williams, & Wilkins, 1996, pp. 611-626.