Field anesthesia

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Abstract

There are a variety of methods for restraint and analgesia for surgical procedures in the bovine. A combination of manual restraint using chutes or ropes, local or regional nerve blocks, and anesthetic agents are often employed in the field. Compounds of varying anesthetic classes may be used singly or in combination to achieve the desired results for the procedure being performed.

Key words: bovine, anesthesia

Résumé

Il existe plusieurs méthodes pour la contention et l'analgésie durant les procédures chirurgicales chez le bovin. Des combinaisons de contention manuelle utilisant des cages (chutes) ou des cordes, des blocs nerveux locaux ou régionaux et des agents anesthésiques sont souvent utilisées sur le terrain. Des composés de plusieurs classes d'anesthésiques peuvent être utilisés seuls ou en combinaison pour parvenir aux résultats escomptés pour la procédure en question.

Introduction

As consumer concern rises about the relief of pain and suffering in our animal species, production animal veterinarians and producers are often scrutinized on standards of care.

There are a variety of challenges in cattle medicine that do not affect our counterparts in equine and small animal practice. Among them are the expected timeliness and economics associated with animal processing, surgical procedures, and the use of controlled drugs in a field setting. In addition, the lack of compounds specifically labeled for ruminants often leaves the veterinarian in a position to determine an appropriate withdrawal time for the use of anesthetic agents.

The Animal Medical Drug Use Clarification Act (AMDUCA) outlines the requirements for the use of drugs in an extralabel fashion. At a minimum, the following criteria must be met:

- Therapeutic purposes only
- Animal's health is threatened
- Suffering or death may result from failure to treat

Most surgical procedures and use of anesthetic agents fall under this segment of the AMDUCA rules.

Lidocaine

Local and regional nerve blocks using lidocaine are commonly used to provide analgesia for standing or recumbent procedures. The relative short duration of action makes these less than ideal for sustained pain relief when administered intramuscularly or subcutaneously. Line block, inverted L block, proximal and distal paravertebral blocks can all successfully be used for flank analgesia. The cornual nerve block can be used to desensitize the horn. Intravenous regional blocks can be used to desensitize the distal limb. Caudal epidural anesthesia can be used to decrease pelvic and perineal pain, while a lumbosacral epidural will block the pelvis and pelvic limbs. Anesthesia of the eye can be accomplished using a Peterson nerve block or a retrobulbar block. These will typically require additional anesthesia of the eyelids, which can be accomplished by an auriculopalpebral or ring block of the eyelids.

All of these methodologies can be used alone or in conjunction with additional compounds to successfully provide surgical pain relief to cattle patients. Local and regional blocks are most often accomplished with lidocaine, which has a rapid onset of action at approximately 5 minutes with a duration of about 90 minutes. For cattle, the maximum dose to avoid toxicity should be considered to be 4.5 mg/lb (10 mg/kg).
Withdrawal time: meat – 4 days; milk – 3 days for cattle

Xylazine

Xylazine can provide dose-dependent analgesia and sedation for approximately 30 minutes. At low doses it can provide analgesia, but the accompanying muscle weakness and cardiac effects make it less ideal for prolonged use. It is important to consider the patient demeanor prior to administration, as excessive sympathetic tone may override the effects. The quieter and calmer the patient, the lower the effective dose. Most tractable cattle will become recumbent with a dose of 0.1 mg/kg IV or 0.2mg/kg IM. The effects of xylazine can be reversed by the use of tolazoline (2 mg/kg IM). This dose can be split half IV and half IM to speed the recovery process, but still limit the likelihood of re-sedation.

Xylazine can also be used in an epidural for prolonged analgesia up to 5 hours. Epidural dose is 0.07 mg/kg diluted to 7.5 mL total volume.
Dose of xylazine: 0.01 mg/kg-0.05 mg/kg IV; 0.02 mg/kg-0.1 mg/kg IM
Withdrawal time: meat – 4 days; milk – 24 hours – IM for cattle

Opioids

A variety of opioids with varying delivery mechanisms are available for use. They all have both analgesic and sedative effects. These drugs are good for mild to moderate pain. Delivery system, availability, and cost may all drive the selection of opioids.

Butorphanol is an opioid analgesic with sedative effects. It can be used alone or in conjunction with other compounds for analgesia or mild sedation. Doses up to 0.25 mg/kg have been investigated for use in cattle.

Dose: Butorphanol: 0.02-0.05 mg/kg IV or SC

Withdrawal time: meat – 5 days; milk – 72 hours

Dose: Nalbuphine (similar to butorphanol): 0.02-0.05 mg/kg IV or SC

Dissociative Anesthetics

Ketamine can provide analgesia or dissociative anesthesia by blocking the NMDA receptors. It is short acting and is most often used in combination with other compounds. As such, recommended doses vary depending on the other agents being used. It is associated with increased muscle rigidity. For pain control, ketamine can be used as a continuous-rate infusion.

Dose: 0.1 mg/kg – 4 mg/kg, IV, IM, SQ – doses vary dramatically depending on concurrent drug use and desired effect.

Withdrawal time: meat – 3 days; milk – 72 hours for cattle

The ketamine stun is a combination of ketamine, xylazine, and butorphanol that is described for use in standing and recumbent procedures. The route of administration and dose will determine recumbency and duration of action. Most animals will exhibit a high level of analgesia. They may seem aware but unconcerned about their surroundings. Local or regional blocks may be necessary for particularly painful procedures.

	Butorphanol	Xylazine	Ketamine	Duration
IV recumbent	0.05-0.1 mg/kg	0.025-0.05 mg/kg	0.3-0.5 mg/kg	15 minutes
IM/SQ recumbent	0.1 mg/kg	0.05 mg/kg	0.5 mg/kg	45 minutes, less intense
IM/SQ standing	0.01 mg/kg	0.02 mg/kg	0.04 mg/kg	60-90 minutes

Benzodiazepines

Midazolam (0.02 – 0.2 mg/kg IV) is a benzodiazepine sedative with minor tranquilizing effects. It provides excellent muscle relaxation with minimal cardiopulmonary depression. It is often used in combination with other drugs for induction or for short procedures.

Withdrawal time: meat – 3 days; milk – 72 hours – cattle

Recommended Reading and Resources

1. Abrahamsen EJ. Chemical restraint and injectable anesthesia of ruminants. *Vet Clin North Am Food Anim Clinic* 2013;29:209-227.
2. Smith G. Extralabel use of anesthetic and analgesic compounds in cattle. *Vet Clin North Am Food Anim Clinic* 2013;29:29-45.
3. Food Animal Residue Avoidance Databank, http://www.farad.org.