1. PURPOSE

The intent of this Standard Operating Procedure (SOP) is to describe methods of assessing pain in ruminants and mitigating pain by administration of analgesic medications.

2. RESPONSIBILITY

Principal investigator (PI) and their research staff, veterinary care staff.

3. GENERAL CONSIDERATIONS

3.1. A procedure which would be expected to be painful if it were done on humans must be considered painful to the animal.

3.2. When there is a question of whether or not a procedure is painful, the animal should receive the benefit of analgesia.

3.3. Analgesia should be provided at an appropriate dose and frequency to control pain.

3.4. Any deviation from this procedure must be justified by the investigator and approved by the appropriate Facility Animal Care Committee (FACC).

4. PAIN RECOGNITION AND ASSESSMENT

4.1. Adapt the frequency of observation to the protocol (minimum once a day).

4.2. Start by observing the animal from a distance so the animal's behavior is not altered by the presence of the observer. Then proceed to observe the animal more closely.

4.3. Look for any changes in the behavior. Report animals which appear to be in pain to the veterinary care staff.

4.4. Common clinical signs indicative of pain or distress include:

    4.4.1. Vocalization

    4.4.2. The animal is isolated from the social group

    4.4.3. Lying down more frequently, immobile

    4.4.4. Apathy, depression

    4.4.5. Altered gait, lameness

    4.4.6. Increased respiratory rate (abdominal pain)

    4.4.7. Cessation of rumination, teeth grinding

    4.4.8. Loss of appetite (partially or totally)

    Note: The most reliable signs of pain and distress are the changes in behavior. This implies a good knowledge of species and individual normal behavior by the observer.

5. ANALGESIA PLAN

5.1. If possible, provide analgesia before the painful stimulus, as it is more effective in preventing pain (e.g. give analgesic before surgery).

5.2. Try to use a combination of analgesics, which is often more effective than using a single agent.

    For example, combination of buprenorphine, ketoprofen, and local infiltration of a local analgesic.

5.3. For surgical procedures, extend analgesia from pre-op to 72 hours post-op, unless specified otherwise in the Animal Use Protocol (AUP) and approved by the FACC.

6. LOCAL ANALGESIA

6.1. Infiltrate or apply local analgesic to areas where a painful stimulus may be induced. Repeat application of local agent at specified intervals to maintain analgesia. In some cases a sedative is recommended when using local analgesia.

Analgesic	Dose	Duration	Note
Lidocaine	< 2 mg/kg	30–60 min.	Use lidocaine HCl 2% (20mg/ml) injectable solution. Because this drug is acidic, it is recommended to dilute it 3:1 with sodium bicarbonate injectable solution (at 5 or 8.4%). Dilution with sodium bicarbonate is not necessary if lidocaine is to be administered to an anesthetized animal. Dilution must be prepared immediately before use and should not be stored. Diluted solution is as effective but induction of analgesia is slightly prolonged.
Bupivacaine	< 2 mg/kg	3–4 hr.	Use bupivacaine HCl 0.50% (5mg/ml) injectable solution. Same comment as for lidocaine.
* Lidocaine-bupivacaine mixture	< 2 mg/kg	30 min. to 4 hrs.	Same comment as for lidocaine. Combining both drugs allows for rapid induction and prolonged effect. Discard mixture after 3 months.
EMLA cream	Thick spread	30–60 min.	Apply a thick layer of cream ideally 10 minutes before the painful procedure.

*most commonly used

7. GENERAL ANALGESIA

Sheep/Goat

Analgesic	Dose	Route	Frequency	Note
*Buprenorphine	0.005–0.01 mg/kg	SC, IM	8–12 hr.	Controlled drug.
Fentanyl	Patch		Every 3 days, starting 24h prior to surgery	50µg -100µg Controlled drug.
Morphine-Lidocaine-Ketamine Combination	2 ml/kg/hr	IV	Constant rate infusion	To a 500 ml bag of fluids add morphine 60mg, lidocaine 750mg and ketamine 150mg. Controlled drugs.
Ketamine	0.1-1.0 mg/kg	SC, IM, IV	-	After initial bolus, constant rate infusion of 0.1-0.3 mg/kg/hr. Controlled drug.
*Ketoprofen	1–2 mg/kg	SC, IM	12–24 hr.	

*most commonly used

Cattle

Analgesic	Dose	Route	Frequency	Note
Buprenorphine	0.005–0.01 mg/kg	SC, IM	8–12 hr.	Controlled drug.
*Flunixin	1 mg/kg	IM,IV	12–24 hr.	
Ketamine	0.1-1.0 mg/kg	SC, IM, IV	-	After initial bolus, constant rate infusion of 0.1-0.3 mg/kg/hr. Controlled drug.
*Ketoprofen	1–2 mg/kg	SC, IM	12–24 hr.	
*Meloxicam	0.5 mg/kg 1 mg/kg	SC, IM PO	24 hr.	Used in calf after dehorning

*most commonly used

7.1.   Administration of non-steroidal anti-inflammatory drugs (NSAIDs):

7.1.1.   NSAIDs include ketoprofen, flunixin, and meloxicam.

7.1.2.   Ensure good water intake and monitor hydration status during the treatment period.

7.1.3.   Suspend water restriction prior to administration of NSAIDs.

7.1.4.   To minimize chances for adverse drug interactions, a washout period of 5-7 days is recommended before switching between NSAIDs.

SOP REVISION HISTORY

DATE	PREVIOUS VERSION	NEW VERSION
2015.04.22	6.1 (NO TEXT)	6.1 **Use lidocaine HCl 2% (20mg/ml) injectable solution.**
2015.04.22	6.1 (NO TEXT)	6.1 **Use bupivacaine HCl 0.50% (5mg/ml) injectable solution.**
2015.04.22	6.1 (NO TEXT)	6.1 Lidocaine-bupivacaine mixture: **Discard mixture after 3 months.**
2016.09.02	7. (NO TEXT)	7. Flunixin, ketoprofen and meloxicam: **Ensure good water intake and monitor hydration status. Suspend water restriction prior to administration.**
2016.09.02	5.2 For example, administer a combination of buprenorphine, ketoprofen, and local infiltration of lidocaine	5.2 For example, administer a combination of buprenorphine, ketoprofen, and local infiltration of lidocaine **a local analgesic.**
2017.01.27	7.1 (NO TEXT)	**7.1. Administration of non-steroidal anti-inflammatory drugs (NSAIDs):** **7.1.1. NSAIDs include ketoprofen, flunixin, and meloxicam.** **7.1.2. Ensure good water intake and monitor hydration status during the treatment period.** **7.1.3. Suspend water restriction prior to administration of NSAIDs.** **7.1.4. To minimize chances for adverse drug interactions, a washout period of 5-7 days is recommended before switching between NSAIDs.**

Comparative Medicine & Animal Resources Centre

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