

STANDARD OPERATING PROCEDURE #109

RUMINANT ANALGESIA

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.
- 4.4.3. Lying down more frequently, immobile

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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. Use a combination of analgesics, which is often more effective than using a single agent. For example, a combination of opioid, non-steroidal anti-inflammatory drug (NSAID), and 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 | Route | Duration | Note |
|-------------|-----------|--|------------|--|
| Lidocaine | < 2 mg/kg | SC, Infiltration to surgical wounds | 30–60 min. | Use lidocaine HCl 2% (20mg/ml) injectable solution. Because this is acidic, it is recommended to dilute it 3:1 in sodium bicarbonate injectable solution (at 8.4%). Dilution should be prepared immediately before use and should not be stored. Diluted solution is effective but duration of analgesia is slightly prolonged. * Dilution in sodium bicarbonate is not necessary if lidocaine is administered to an anesthetized animal. |
| Bupivacaine | < 2 mg/kg | SC, Infiltration to surgical wounds | 3–4 hr | Use bupivacaine HCl 0.50% (5mg/ml) injectable solution. Same comments as lidocaine. |

* Lidocaine - bupivacaine

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Cattle

| Analgesic | Dose | Route | Frequency | Note |
|-------------|----------------------|--------------|-----------|--|
| Bupivacaine | 0.005–0.01 mg/kg | SC, IM | 8–12 hr | Collected dg. |
| *Flunixin | 1 mg/kg | IM, IV | 12–24 hr | |
| Ketamine | 0.1-1.0 mg/kg | SC, IM, IV | - | After initial bolus, constant infusion 0.1-0.3 mg/kg/hr Collected dg. |
| *Ketofen | 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 |

*metamolyzed

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

SOP REVISION HISTORY

| DATE | NEW VERSION |
|------------|--|
| 2015.04.22 | 6.1 Use lidocaine HCl 2% (20mg/ml) injectable solution. |
| 2015.04.22 | 6.1 Use bupivacaine HCl 0.50% (5mg/ml) injectable solution. |
| 2015.04.22 | 6.1 Lidocaine -bupivacaine mix. Discard mixture after 3 months. |
| 2016.09.02 | 7. Flunixin, ketofen and meloxicam: Ensure good water intake and monitor hydration status. Suspend water restriction prior to administration. |
| 2016.09.02 | 5.2 Example, administer a combination of bupivacaine, ketofen, and local infiltration of lidocaine—a local analgesic. |
| 2017.01.27 | 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. |
| 2020.04.20 | 4.1. Adapt the frequency based on the invasiveness of the procedure. 4.1. |