Providing Adequate Pain Relief in the Field
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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. Despite the increasing demand for pain control many practitioners still do not use analgesics for routine procedures. 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 of animal processing and the use of controlled drugs in a field setting. In addition, the lack of compounds specifically labelled for pain relief in cattle often leaves the veterinarian in a position to determine an appropriate withdrawal time for the use of analgesic and anesthetic agents.

Local and regional nerve blocks
Local and regional blocks are commonly used to provide analgesia for standing or recumbent procedures. Line block, inverted L block, proximal and distal paravertebral blocks can all successfully be used for flank analgesia. The cornual block can be used to desensitize the horn. Intravenous region blocks can be used to desensitize the foot. Epidural anesthesia can be used to decrease pelvic and perineal pain. 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. Lidocaine hydrochloride is approved for use in cattle and carries a 4 day meat and 3 day milk discard for volumes standardly in practice. For cattle the maximum dose to avoid toxicity should be considered to be 10mg/kg.

Chemical restraint
Xylazine, butorphanol, and ketamine are perhaps the most common agents used alone or in combination for chemical restraint and anesthesia in cattle. Benzodiazepines can also be used successfully in these protocols.

- Xylazine (0.01mg/kg-0.05mg/kg IV; 0.02mg/kg-0.1mg/kg IM) will provide a dose dependent degree of sedation and analgesia for approximately 30 minutes. It is important to consider the patient demeanor prior to administration as excessive sympathetic tone may override the effects. The more quiet and calm 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 resedation.

- Butorphanol (0.02mg/kg – 0.05 mg/kg IV or IM) 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 0.25mg/kg have been investigated for use in cattle. Withdrawal of butorphanol for meat and milk is suggested at 5 days and 72 hours.

- Ketamine is a short acting dissociative anesthetic that is most often used in combination with other compounds. As such recommended doses vary (0.1mg/kg – 5mg/kg). Withdrawal for meat and milk is recommended at 72 hours for each.

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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 away but unconcerned about their surroundings. Local or regional blocks may be necessary for particularly painful procedures.

<table>
<thead>
<tr>
<th>Butorphanol</th>
<th>Xylazine</th>
<th>Ketamine</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV recumbent</td>
<td>0.05-0.1mg/kg</td>
<td>0.025-0.05mg/kg</td>
<td>0.3-0.5mg/kg</td>
</tr>
<tr>
<td>IM/SQ recumbent</td>
<td>0.1mg/kg</td>
<td>0.05mg/kg</td>
<td>0.5mg/kg</td>
</tr>
<tr>
<td>IM/SQ standing</td>
<td>0.01mg/kg</td>
<td>0.02mg/kg</td>
<td>0.04mg/kg</td>
</tr>
</tbody>
</table>

Nonsteroidal anti-inflammatory agents
Nonsteroidal anti-inflammatory agents are also commonly used. Flunixin meglumine is most commonly used in the United States as it has a label for beef and dairy cattle for the control of pyrexia associated with bovine respiratory disease and mastitis and the control of inflammation due to endotoxemia. When used according to label directions (2.2 mg/kg IV) the meat and milk withdrawals are 4 days and 36 hours, respectively. The extralabel use of meloxicam has also gained traction as an analgesic agent. Doses ranging from 0.5mg/kg – 1.0mg/kg have been evaluated and found effective. Recommended meat withdrawal is 21 days but it is important to recognize that tissue drug levels after repeated dosing have not been critically evaluated and this practice would likely extend withdrawal times.
**Recommended reading and resources**


Food Animal Residue Avoidance Databank
http://www.farad.org