Cattle pain management: an update

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MATTHEW GURNEY reviews research into bovine analgesia, and finds that despite limited licensed drugs for cattle, a pre-emptive, multimodal approach to pain management can deliver good results.

This article aims to provide a review of the literature concerning pain management in cattle. To do this, a Pubmed (www.ncbi.nlm.nih.gov/pubmed) search was performed using the terms “cattle pain” and “cattle analgesia”. Papers published within the past five years were selected.

In the past few years, several questionnaires have been conducted to assess the subject of pain in cattle. A Canadian survey into analgesic practices in cattle concluded there was an urgent need for veterinarians to better manage pain in livestock. The authors stated that continuing education would help, as would an increase in approved, cost-effective analgesic drugs with known withdrawal periods (Hewson et al, 2007).

Another questionnaire investigated the attitudes and perceptions of cattle practitioners to painful bovine procedures and conditions. The study concluded that more needed to be done to disseminate up-to-date knowledge of pain in cattle to veterinarians, to ensure they provided appropriate levels of analgesia (Laven et al, 2009).

So, what constitutes a painful procedure? Huxley et al (2006) posed this question in a survey of British cattle practitioners. Digit amputation was considered most painful for adult cattle; the least painful were neck calluses. For calves, least painful was pain associated with dystocia; most painful were umbilical hernia repair and long-bone fractures.
In a similar survey of Norwegian veterinary students, conditions associated with a high degree of pain were fractured tuber coxae, dystocia requiring the help of two people, and serious mastitis (Kielland et al, 2009).

Results of both the Canadian and UK studies echo those of similar studies looking at pain in dogs and cats. Those members of the profession most likely to provide analgesia are women and recent graduates. Those who do not routinely use analgesics in cattle are also more likely to assign lower pain scores to a given condition. In the Norwegian study when using a 10-point pain scale, women assigned scores 0.9 higher than the men.

**Analgesia after major surgery**

Huxley et al (2006) found clear room for improvement in the use of NSAIDs after major surgery. For procedures such as claw amputation, caesarean section and umbilical hernia repair, only around 60 per cent of cases received an NSAID, despite these being considered the most painful procedures for cattle.

Research presented at last year’s World Congress of Veterinary Anaesthesia (Meyer et al, 2009) investigated the perioperative use of carprofen in calves undergoing umbilical hernia repair. This study showed that calves treated with carprofen immediately before surgery, and again 72 hours later, showed lower pain scores, a higher feed intake and greater weight gain compared to calves receiving saline.

**Effective analgesia**

The most effective analgesia is pre-emptive and multimodal (Table 1). The stress response to surgery is often used as an indicator of the efficacy of peri-operative analgesia. Studies in humans and dogs show that when surgery is performed with the benefit of local anaesthesia (Table 2), the stress response is attenuated. However, as the effect of the local anaesthesia declines in the postoperative period, the stress response increases. For this reason, an NSAID should also be used in conjunction with local anaesthetic techniques.

Chevalier et al (2004) examined the effect of epidural xylazine 0.05mg/kg in combination with paravertebral analgesia for intra-operative and postoperative pain during flank laparotomy. Cattle that received the combination of epidural and paravertebral reacted less to local anaesthetic injection, were more sedated and required less local anaesthetic than those receiving paravertebral analgesia alone. However, no discernible differences in postoperative pain scores were noted. This may have been due to the concurrent administration of an NSAID to all cattle. The authors did note that at 24 hours post-surgery, pain scores were higher in all cattle – reinforcing the view that continued analgesia is necessary.

Much of the literature regarding analgesia for dehorning dates from the late 1990s. In the absence
of more recent information, these papers have been included in this review. Two pertinent studies confirm the need for a multimodal approach to provide effective analgesia for dehorning. Grondahl-Nielsen et al (1999) demonstrated that the corneal nerve block reduced the behavioural manifestations of pain associated with hot dehorning. The work of McMeekan et al (1998) clearly showed that when systemic analgesia (ketoprofen) was combined with a corneal nerve block plasma, cortisol levels were similar to control animals that were not dehorned.

**Detecting pain in cattle**

As one of dairy farming's biggest welfare concerns, the assessment of lameness is the most studied indicator of pain in cattle. Cattle practitioners and farmers can easily spot a lame cow.

In investigating post-castration pain in calves, Currah et al (2009) used pedometers and stride-length measurements. After castration, calves showed a decrease in stride length, an overall decrease in activity and a decrease in the number of steps taken. When given systemic flunixin and an epidural of lidocaine, these calves showed the least decrease in stride length compared to a control group.

Previous studies demonstrated that rubber ring, surgical and Burdizzo castration all caused acute pain (Robertson et al, 1994), but six-day-old calves elicited less pain response than 21-day-old or 42-day-old calves. Burdizzo was found to be the least-painful method.

Two bloodless castration methods (rubber ring and Burdizzo) were examined in a Swiss study (Thuer et al, 2007) and compared in animals with and without infiltration of local anaesthetic into the spermatic cord and scrotal neck. Local anaesthesia reduced the pain responses, but did not alleviate all the signs of acute pain – highlighting the need for further analgesia in addition to local anaesthetic. In this same study, the duration of pain following both bloodless methods was examined. The authors concluded that pain was present for several weeks after rubber-ring castration.

The work of Thuer et al (2007) suggested that analgesia, in addition to pain relief afforded by local anaesthesia, was necessary for castration. This view is supported by Zulauf et al (2003), who demonstrated a positive effect of an NSAID after Burdizzo castration, as shown by increased concentrate intake and less scrotal swelling in the three days after castration.

Measurement of plasma cortisol is, unfortunately, not specific for nociception; handling animals alone causes large increase in plasma cortisol. In a study investigating castration, Coetzee et al (2008) measured plasma levels of substance P as well as cortisol. Substance P is a prototypic neuropeptide for many molecules involved in the processing and transmission of nociceptive input. This study found no significant difference in cortisol levels in calves that were castrated and calves that were handled but not castrated (simulated castration). The substance P data showed a significant rise in plasma levels of this substance following castration, but not in the control group.
The study concluded that measurement of substance P levels could be a useful tool to differentiate between painful and stressful procedures.

Further work in this area is anticipated. So far, many studies have used cortisol levels, often in combination with behavioural assessments, in the absence of more specific indicators or tests. A stimulus for this work relates to drug licensing in the USA. No analgesics are currently approved by the Food and Drug Administration for cattle, because it insists that a validated method of pain assessment must be used to test the drug. Thus, in the absence of a validated method, no analgesic drugs are available.

**Behavioural indicators of pain in adult cattle**

These indicators can include:

- increased lying time;
- subdued demeanour;
- eating and ruminating less;
- failure to clean nostrils;
- licking other cattle less; and
- failure to return other cattle’s aggressive behaviour.

**Chronic pain in cattle**

Bergadano et al (2006) described a Swiss brown cow that underwent digit amputation, but 39 days later developed signs consistent with complex regional pain syndrome (CRPS) – a syndrome more common in people than cattle. Its features include:

- an initiating noxious event;
- spontaneous pain or allodynia/hyperalgesia;
- oedema or abnormalities in the skin blood flow;
- nerve injury; and
- exclusion of other potential causes.
In the case described, the cow demonstrated signs including non-weight-bearing pelvic limb lameness, muscle atrophy, hyperalgesia (rapid limb withdrawal in response to light touch), oedema of the fetlock and absence of joint infection. This case was unusual because CRPS developed despite peri-operative multimodal analgesia consisting of intravenous regional anaesthesia and NSAIDs. Treatment of the CRPS involved a multimodal approach using an epidural infusion including local anaesthesia, opioids, ketamine and alpha-2 agonists over 17 days. The cow was discharged with mild lameness and a muchimproved clinical condition.

The AVA: Association of Veterinary Anaesthetists

This association’s ethics and welfare forum has a literature screening committee that aims:

• to judge cases of unethical animal treatment, as reported in all branches of scientific literature, as a preliminary step to recommending an AVA response;

• to monitor and record the incidence of reported cases and publish the results of ongoing studies in this area; and

• as a result of these:

– to reduce the publication of unethical material; and

– to raise the AVA’s profile.

In a paper published in 2007 (Starke et al), the use of analgesia for fetlock arthrotomy and arthrodesis in cattle was poorly described in the initial manuscript, prompting a response from the AVA. The ensuing discussion and outcome can be read on the “ethics and welfare” page of the association’s website (www.ava.eu.com). If you find reports in the literature in which analgesia appears to have been neglected in any case, see the same webpage for information on how to notify the AVA.

Conclusion

The field of analgesia in cattle practice is continually advancing – albeit in the face of an apparently limited number of licensed products.

Many of the studies cited here demonstrate the ability to provide excellent analgesia with the drugs available, mainly by adopting the principles of pre-emptive, multimodal analgesia.

References