

# Pain management in cattle

**Maura Langan MVB, veterinary adviser, Norbrook Laboratories Ltd, Monaghan, discusses identifying, managing and grading the different types of pain in farm animals**

On joining the veterinary profession we, as vets, have a legally-binding undertaking to safeguard the wellbeing and welfare of animals. Pain management is central to the care of animals but pain is a complex experience for farm animals, as well as being complex to identify and grade in the non-verbal animal.

## WHAT IS PAIN?

Pain is defined as an unpleasant sensory or emotional experience associated with actual or potential tissue damage. This is one of the oldest and most concise definitions of pain. Its definition is further complicated, as it comprises of two components: a physiological sensory and a psychological or emotional component. Essentially, both these components respond to a stimulus that is, or is potentially, damaging to tissues, causing nerve impulses to fire along pain-specific nerves towards the spinal cord and brain.

This stimulus causes a protective response:

- Conscious – attempts to escape or avoid the painful stimulus; and
- Unconscious – withdrawal reflex, cardiovascular response, inflammation.

The type of pain that the animal is experiencing can be classified in several different ways, including:

- Anatomic – somatic or visceral pain; and
- Temporal – acute or chronic pain.

Acute pain is a protective mechanism that can be defined as “the every-day experience of discomfort that occurs in response to a stimulus or injury”. Acute pain makes animals

notice an injury and move away from the danger that caused the injury; thus, it is generally short-lived pain.

Chronic pain is pain that has persisted beyond the normal tissue healing time. It may or may not be associated with recent injury, but is generally associated with inflammation and changes to nerve cells in the spinal cord and brain. This ‘wind-up’ phenomenon is an increase in sensitisation of excitable nerve cells and thus, something normally, mildly painful becomes very painful after repeated insults. In addition, changes in the spinal cord and brain make pain resistant to treatment with analgesics. Chronic pain is common in livestock, for example, the chronically lame cow. Mechanistically pain can be classified as inflammatory or neuropathic. Inflammatory pain is associated with tissue trauma and inflammation, while neuropathic pain is associated with nerve injury.

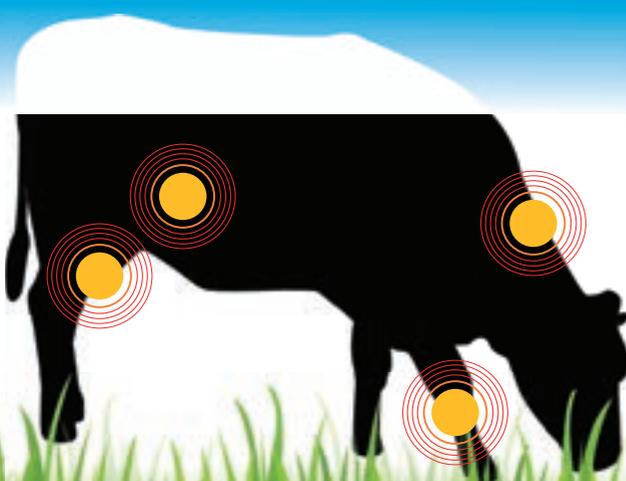
Inflammation is a localised protective response stimulated by injury or destruction of tissues, which serves to destroy, dilute, or wall off both the injurious agent and the injured tissue. The inflammatory response can be provoked by physical trauma, chemicals and biological agents, including infectious agents such as bacteria, viruses, and other pathogenic microorganisms. The classic signs of inflammation are heat, redness, swelling, pain, and loss of function.

## PHYSIOLOGICAL RESPONSE TO PAIN

The main glucocorticoid hormone that is released in response to stresses including pain is cortisol. Severe or prolonged pain results in severe stress that eventually

### PHYSIOLOGICAL

What the animal actually feels as a direct result of a condition, procedure or injury foot pain caused by lameness.



### PSYCHOLOGICAL/EMOTIONAL

The conscious perception of the pain, and the longer-term effects that the painful incident has on the animal, eg. not eating because the animal does not want to walk to the feed trough because walking is painful.

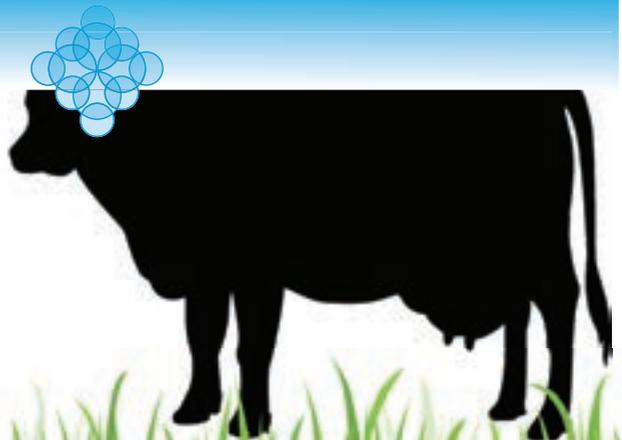


Figure 1: Physiological and psychological pain.



**Figure 2: Assisted birth causing pain.**

becomes destructive. Severe stress and pain leads to depression and immunosuppression of the animal. Cortisol levels are a useful measure of stress associated with painful procedures such as castration and dehorning.

**RECOGNITION OF PAIN IN FARM ANIMALS**

Animals cannot verbalise when in pain and therefore the assessment and quantification of pain is fraught with difficulties. Nevertheless, recognising pain and assessing its intensity are essential for its effective management. While numerous attempts have been made to develop methods of assessing pain in animals, as of yet few validated assessment techniques are available. Therefore, in most circumstances, pain is assessed based on the animals’ clinical appearance and overall behaviour. In a practical on-farm situation, a number of objective and subjective indicators can be used to assess pain. Signs of pain in livestock vary hugely and can range from subtleties such as mild postural changes and inappetence to recumbency and extreme vocalisation. It is worth pointing out that cattle are stoical animals by nature and they might not demonstrate any appreciable signs of pain until the stimuli are severe. Evaluation of these indicators of pain should form the basis of any clinical examination.

These may include:

- Decreased movements;
- Changes in normal posture;
- Isolation from group;
- Decreased feed intake;
- Altered locomotion, flank watching, ear twitching;
- Bruxism, salivation;
- Reduced responsiveness to stimuli, increased heart rate, altered rate and depth of breathing;
- Vocalisation;
- Reduced milk yield;
- Loss of body condition; and
- Decreased productivity.

**CAUSES OF PAIN**

Pain or inflammation can occur, as a result of diseases

present on farm, or as a result of procedures imposed on animals as part of day-to-day farm management.

**Painful disease processes:**

- Lameness;
- Mastitis;
- Joint/navel ill;
- Eye problems: pink eye and New Forest eye;
- Downer cows;
- Pneumonia; and
- Metritis.

**Management procedures that cause pain:**

- Disbudding/dehorning;
- Tail docking;
- Castration;
- Caesareans/abdominal surgery; and
- Assisted births/dystocia.

**PAIN AND PRODUCTIVITY: THE EFFECTS OF PAIN**

Pain and inflammation in farm animals are a drain on productivity. Pain reduces animal performance, be that growth rate in young animals or milk yield in adult animals. Despite our best efforts to prevent disease, there will always be situations on farms, where the initiation of pain or inflammation cannot be avoided. Management producers that impose pain such as castration and dehorning can’t be avoided. Nevertheless, the prompt or even pre-emptive treatment of these diseases or procedures with appropriate anti-inflammatory or pain relief can reap rewards. Take, for example, the transition cow that has experienced dystocia. This animal is in pain and without appropriate treatment, cortisol levels rise.

As stated earlier, increased cortisol levels lead to immune suppression making this cow more prone to respiratory infection, mastitis, metritis, etc. Also, animals in pain spend less time eating and ruminating. Therefore, a cow in early lactation with inadequate feed intake quickly goes into negative energy balance, becomes ketotic and is predisposed to a displaced abomasum (DA). A robust strategy to decrease pain and inflammation in such a case will help to alleviate the chain of events that ensue and lead to a much more complicated picture for the

particular animal.

Pain management that is implemented on farm as part of the standard day-to-day operating procedures will serve to improve animal welfare, and improve the economic efficiency of the holding.

### ALLEVIATING PAIN IN CATTLE

Pain in cattle may be alleviated by pre-emptive, reactive or multimodal analgesia. Pre-emptive analgesia is well adopted by small animal clinicians is preferable if the pain is predictable, ie. for surgical procedures. The easiest type of pain to treat is that that is induced. Research shows that there is less of an effect if analgesia is administered after the noxious stimulus has been established. Obviously, this is not always possible so the provision of pain relief as soon as possible after the onset of pain is important. Pre-emptive analgesia is likely to be more effective than reactive analgesia and 'wind up' and 'hyperalgesia' are less likely to occur. It is well recognised in both human and SA medicine that the most effective analgesia is provided by multimodal analgesia, using a combination of drugs that act on different pathways. Such a method could be used in cases of dystocia. An epidural of local anaesthetic, as well as xylazine, alongside systemic non-steroidal anti-inflammatory drugs (NSAIDs), would provide appropriate analgesia.

There are several routes of administration that can be used to provide analgesia to cattle.

#### SYSTEMIC ANALGESIA

This involves the parenteral provision of systemically-active analgesic agents. Analgesic drugs available for systemic use include NSAIDs, alpha-2-agonists and opioids. Licensing is a major consideration when prescribing drugs for use in food-producing animals. This places many restrictions on what can be used in cattle. NSAIDs containing flunixin meglumine, carprofen, meloxicam, ketoprofen, as well as the alpha-2-agonists, xylazine and detomidine are licensed.

#### REGIONAL AND LOCAL ANALGESIA

Local anaesthetics are the most commonly used pre-emptive analgesic agents used in food-producing animals. Local analgesia can be provided using epidural analgesia, intravenous regional anaesthesia (IVRA) and local nerve blocks.

#### EPIDURAL ANALGESIA

This is relatively quick and easy to perform in cattle. Analgesic agents are injected into the epidural space to desensitise the nerves leaving the spinal cord. Most commonly, low-volume epidural anaesthesia of 4ml-6ml is performed in the adult cow. This provides anaesthesia of the genital tract, rectum and abolishes tenesmus. For the most part, local anaesthetic is used alone in epidural but xylazine can be used in combination with it. Xylazine provides longer duration of action than a local anaesthetic alone thus both agents are often used in combination. The administration of xylazine by this route is off-label.

#### INTRAVENOUS REGIONAL ANAESTHESIA

This is a quick and easy way to desensitise a limb distal to a tourniquet. It is useful for painful procedures of the foot. The effects of the IVRA wear off once the tourniquet is released therefore further analgesia should be provided by administration of NSAIDs. The administration of local anaesthetics intravenously by this method is off label.

#### LOCAL NERVE BLOCKS

Numerous nerve block techniques are described in cattle, eg. paravertebral providing analgesia for flank surgery. The acute pain of dehorning can be alleviated by using a local anaesthetic by way of the cornual nerve block. Local anaesthetic agents are most commonly used for such nerve blocks providing 30-90 minutes of effective anaesthesia. Procaine is the only licensed local anaesthetic for use in cattle. Numerous studies highlight the need for a multimodal approach to pain management. Stafford et al, 2002, compared various surgical castration techniques with or without local anaesthetics or NSAIDs. Local anaesthetic alone did not prevent cortisol increase, but local anaesthesia plus an NSAID did obtund the cortisol response. Another study, Faulkner and Weary, 2000, showed that dehorning calves who were four to eight weeks old under sedation and local anaesthetic was beneficial only when combined with an NSAID. Calves that received an NSAID had less head shaking, head rubbing, ear flicking and gained more weight compared with calves that received sedation and local anaesthetic alone. With regard to treatment of mastitis, NSAIDs administered to cows with *Escherichiae coli* mastitis resulted in: reduced temperature post-treatment, restored gut motility faster, earlier improvement of clinical signs, reduced inflammation of the udder, higher milk yields after treatment and reduced somatic cell counts.

#### PREVENTION OF PAIN

Many diseases process that are responsible for pain in animals are preventable through vaccination. Therefore, vaccination should be a major component of the farms herd health programme. It is a cost-effective means of preventing disease such as respiratory disease and the pain that is associated with the disease.

#### SUMMARY

Recognising pain and assessing its intensity are essential for its effective management. While there has been an increase in the awareness of pain management in cattle over the last number of years, there is still probably room for improvement given that attitudes to pain management in cattle have lagged behind those in companion animal species. Concepts such as pre-emptive and multimodal analgesia need to become routinely practiced in bovine pain management.

#### REFERENCES ON REQUEST