Should we control the pain of mastitis?

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Mastitis remains one of the most important endemic production diseases of dairy cattle worldwide.

Most evidence would suggest that its incidence has actually increased in recent years as average yields have improved. Whilst the production losses and the financial implications of mastitis are well documented, little work has concentrated on the pain associated with this very common condition.

Pain in animals

The International Association for the Study of Pain have described pain as 'an unpleasant sensory and emotional experience associated with actual or potential tissue damage'.

It is reasonable to suppose that animals experience pain in a similar way to humans because experimental work has demonstrated that the neural pathways of pain sensation are similar in human and other mammals.

Assessing pain in animals is extremely difficult because pain is a personal experience and they are unable to communicate the levels of discomfort they are feeling.

Therefore, we must rely on other indicators in order to identify animals that are suffering, such as behavioural changes or markers of a stress response (for example blood cortisol levels).

Alternatively, experienced animal workers can make a value judgement in order to gauge the level of pain an animal is suffering. In these circumstances it is likely that observers draw on their experience of assessing a range of indicators including behaviour, posture, demeanour and other clues.

Additionally, it is likely that they consciously or subconsciously draw on their own personal experience of similar conditions.

Indicators of pain

Indicators of discomfort suggest that mastitis causes pain. Mastitis can be graded on a three point scale. Research work has demonstrated that the heart rate and respiration rate of cows with grade two mastitis were significantly higher than normal animals (Figs. 1 and 2) and the hock-hock distance was significantly higher in cows with both grade one and grade two mastitis.

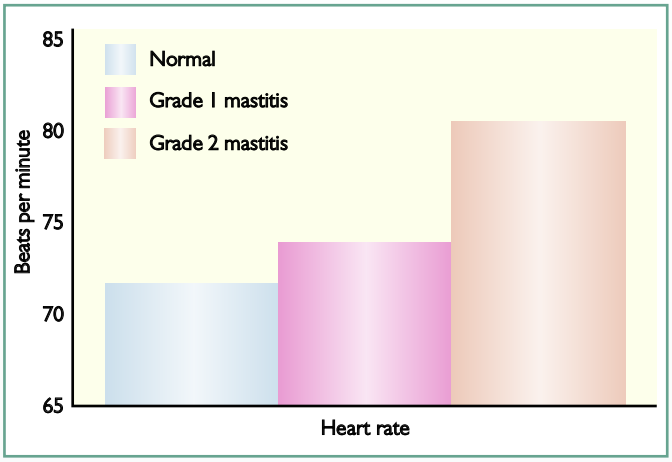

Fig. 1. Heart rate of cows with mastitis.

Markers of pain

Mediators of inflammation and pain such, as prostaglandins, thromboxanes and bradykinins, are released in response to tissue injury and infection.

Elevated levels of bradykinins and other pain mediators have been demonstrated in quarters suffering from even mild cases of mastitis.

Modulation of pain

If a disease or injury causes pain, the presence of high levels of inflammatory mediators around the site of injury and persistent activation of pain fibre pathways in the spinal cord leads to a decrease in pain threshold, so that stimuli are perceived as more painful than would normally be the case. This phenomenon is known as hyperalgesia.

Another finding associated with chronic pain is allodynia, whereby, similar mechanisms lead to perception of normally non-painful stimuli as painful. Recent findings have demonstrated that the response to a mechanical stimulus (a blunt ended pin applied to the hind legs) is altered in cows suffering mastitis (Fig. 3).

Grading cases of mastitis

Mastitis can be graded on a three point scale:

- **Grade 1** – Clots in the milk only.
- **Grade 2** – Clots in the milk and a swollen quarter.
- **Grade 3** – The cow is systemically affected (off colour, not eating and may have a high temperature).

Mastitis alters how pain is processed and may cause hyperalgesia and allodynia. This additional experimental data further strengthens the argument that mastitis is a painful condition.

Estimation of severity

The results of two recent surveys conducted by the author and co-workers, of over 2,500 veterinarians

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Identifying pain in cattle

Cattle are stoical animals. They do not show very obvious signs of pain, probably because they are descended from prey animals which have evolved to mask the signs of pain (and, therefore, weakness) from predators. Identifying pain in cattle can be difficult, but the following indicators may be useful:

- Decrease in movement/locomotion.
- A dull or depressed appearance.
- A reduction in feed intake or an empty rumen. Weight loss.
- Decreased interaction with other animals in the group.
- Decreased milk yield.
- Changes caused by the source of the pain, for example, increased hock-hock distance, lameness, flank watching or kicking and ear twitching.
- Changes in normal postures, for example, standing motionless and rigid and drooped ears.
- Increased heart rate.
- Rapid shallow breathing.
- Grunting and trembling.
- Teeth grinding.
- Poor coat condition (for example, rough or unkempt) caused by decreased grooming.

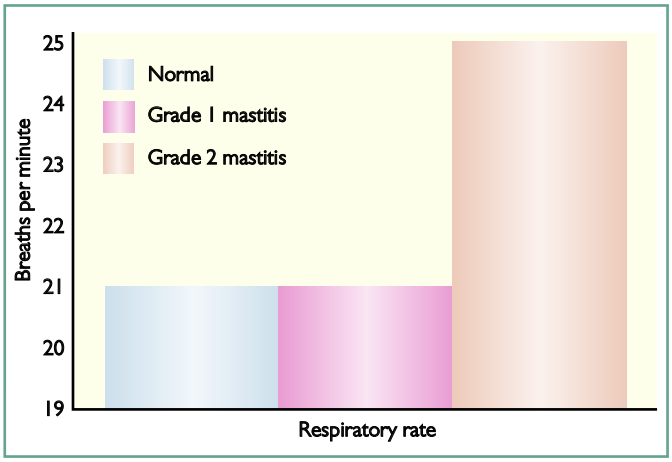

Fig. 2. Respiratory rate of cows with mastitis.

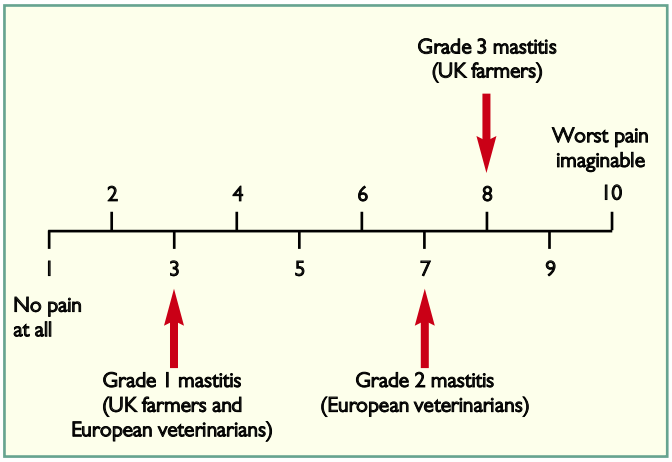

Fig. 4. Estimated pain of mastitis.

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from across Europe and 1,000 cattle farmers from the UK, have indicated that mastitis is considered a painful condition.

Respondents to the surveys were asked to estimate how painful they thought mastitis was on a ten point pain scale (1 = no pain at all; 10 = the worst pain imaginable). The 'average' practitioner considered that a case of grade one mastitis was a score three and grade three mastitis was a score seven (Fig. 4).

Similarly, the average farmer considered that a case of grade one mastitis was a score three and grade three mastitis was a score eight.

Whilst these are only subjective estimates, these results indicate that individuals with the most practical experience of mastitis consider it a painful conditions, ranging from three to eight on a 10 point pain scale.

To gain an idea of this level of pain, readers are encouraged to estimate where they would place a bad headache, a severe toothache or a broken bone on the scale if they were suffering these conditions.

Non-Steroidal Anti-inflammatory Drugs (NSAIDs) are a very important and commonly used group of drugs in both human and veterinary medicine. They have three main properties, they are analgesic (reduce pain), anti-inflammatory (reduce inflammation) and antipyretic (lower a raised temperature).

The actions of NSAIDs are due to their ability to inhibit arachidonate cyclo-oxygenase (COX) enzymes which leads to a reduction in the synthesis of prostaglandins and thromboxanes.

Prostaglandins and thromboxanes cause inflammation and pain (Fig. 5). NSAIDs are currently the only suitable licensed products for controlling the pain associated with mastitis.

The use of NSAIDs

The use of NSAIDs in cases of grade three mastitis, for example, sick cows and cases of acute toxic E. coli mastitis, are well established both experimentally and clinically. They are one of the treatment options which most influence a successful recovery.

Their use should be routine in all severe cases, not only for their anti-inflammatory and anti-endotoxic properties but also, to control the pain associated with this unpleasant condition.

The use of NSAIDs in cases of grade one and grade two mastitis is much less clearly defined.

However, recent work has suggested that meloxicam can influence the pain modulation caused by this level of mastitis and that a single dose is just as affective as three doses administered daily.

Other experimental evidence is currently lacking, however, the existing data on pain now makes the use of NSAIDs in mild and moderate cases a logical treatment option.

Whilst undoubtedly the cost associated with NSAID treatment may well be an issue in commercial situations this does not mean that the use of NSAID should not be discussed and considered in all mastitis cases. In many situations the cost associated with a single shot of NSAID will not preclude their use.

The additional benefits that NSAID treatment offers should also be considered because they will reduce inflammation and promote rapid recovery of the mammary gland.

Conclusions

There is a growing weight of evidence that mastitis is a painful condition. Those of us working in the dairy industry should be doing more firstly to reduce the number of cases of mastitis that occur and secondly to control the pain caused when cases do arise.

Currently, NSAIDs are the only suitable products licensed within the EU to control the pain associated with mastitis and their usage for this indication should be encouraged. ■

Fig. 3. Difference in pain threshold levels in cows with mastitis. The values represent the differences in pressure necessary to elicit a response between the two legs. Therefore, a lower threshold on the same side as the quarter suffering mastitis is represented by a higher level.

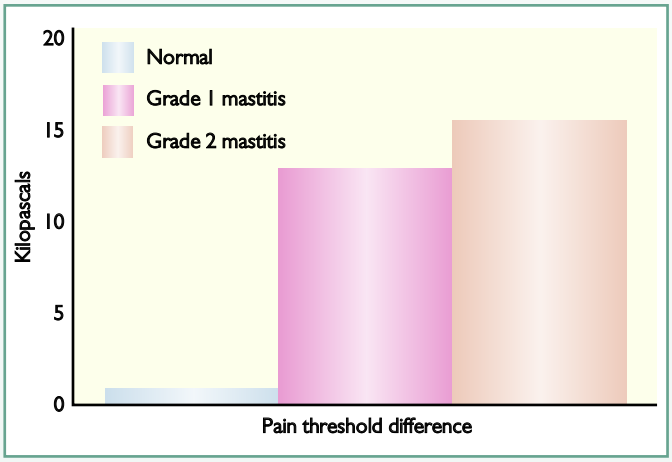

Fig. 5. The role of NSAIDs in controlling pain.