

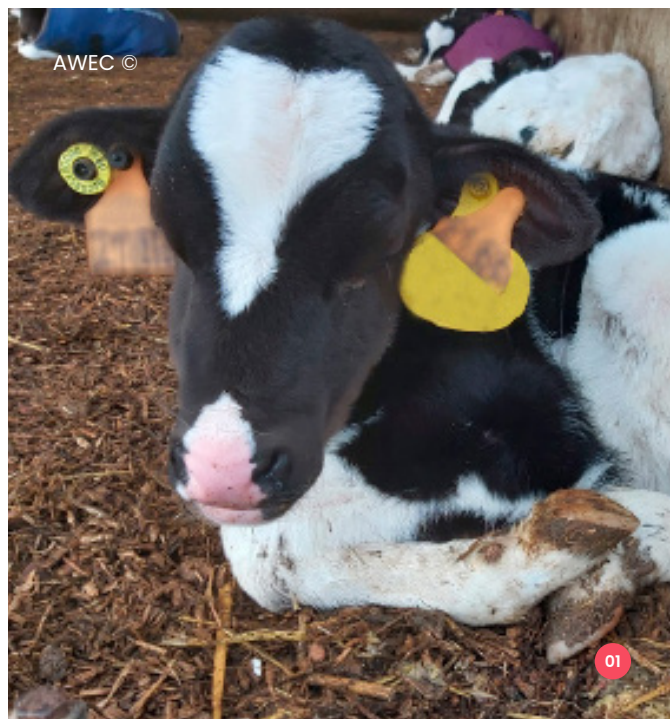
**AWEC**ANIMAL  
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# Evaluation and identification of pain in cattle

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**Pain is a sensorial and emotional negative experience that has negative effects on animal welfare and production.**

**In dairy cattle, pain can be produced by routine procedures such as disbudding or castration, in some diseases like lameness, mastitis or pneumonia and injuries. Also, some physiological procedures, such as labour, can be a painful experience.**

The fact that an animal experiences pain has repercussions both in terms of welfare and a reduction of production. In dairy cattle, milk production and fertility decreases while in calves it reduces the average daily gain.

For this reason, it is important to prevent pain whenever as possible, applying sanitary protocols in order to avoid diseases and to apply analgesia and anaesthesia when painful procedures are carried out.

## ● PAIN IN NEONATES

It is speculated that neonates are less sensitive to pain than adults, but there are scientific evidences that can deny it. Calves belong to the group of precocious species. This means that they are born with a high motor and sensory development, and they have the developed and functional structures for the conscious perception of pain from birth.

Some studies demonstrate that painful procedures on calves at an early age,

for example disbudding, can inflict acute pain during the procedure but also increasing sensitization to pain in the longer term. This means that pain experimented in neonates can provoke durable changes on the perception of pain in adults, for instance hyperalgesia (increased sensitivity of pain) and allodynia (abnormal perception of pain to non-painful stimuli).

## ● EVALUATION OF PAIN

Evaluation and control of pain are important in terms of welfare. Identification of pain in cattle it is a challenge due to stoic behaviour because they are predated species that tend to avoid signs of alarm in front of predators. Cattle tend to mask pain, which is this reason to give a false impression that they are insensitive to pain.

Therefore, pain is evaluated using a combination of productive, physiological and behavioural indicators, and recently, with the evaluation of facial expressions.

The main **productive indicator** affected due to pain in calves is feed intake, which decreases and consequently animals present lower average daily gain and lower live weight. In dairy cows, milk production and fertility decreases. These indicators are easy to obtain but they are non-specific, as they can be caused by other causes than pain.

The main **physiological indicators** in pain situations are increased heart and respiratory rates and body temperature; plasma stress markers, for example, cortisol, and tissue injury markers, such as acute phase proteins. Physiological indicators are more difficult to obtain and require more time. Moreover, physiological indicators are also non-specific for pain because they can be altered in other situations.

## > Figure 01

Calf with diarrhea problems showing signs of pain as it shows a low position of the ears and a slight strain above the eyes.

**Cortisol** is a glucocorticoid hormone produced by the suprarenal gland. Cortisol secretion increases with stress, as a response of diseases or injuries, and as a consequence of fear and pain. Acute phase proteins are produced as an immune response after tissue damage by trauma, inflammation, neoplasia and stress.

The most **notable behavioural indicators** are: (a) antalgic postures, i.e. to arch the back in calves with diarrhoea or presenting head down and neck stretched to facilitate the air entrance when there are respiratory problems; (b) staring at a painful area; (c) vocalisations; (d) teeth grinding (bruxism); (e) social behaviour modification, i.e. decreasing play behaviour or mount in cows whit oestrus; and (f) changes in general activity, i.e. decreased locomotion. Behavioural indicators show a higher validity and specificity for pain evaluation. However, these indicators require time and trained personnel.

Considering that animals cannot express when and how intensely they are experiencing pain, the objective study of pain sensitivity (and the determination of the pain threshold) have special interest. Pain sensitivity can be quantified mechanically (by exerting pressure with algometers) or thermally (using a CO2 laser). These methods measure the nociceptive threshold, which is the least necessary stimuli to induce a pain response. When the stimulus is applied in a painful area, the animal responds with avoidance behaviour such as kicking, raising up the paws or doing intense tail movements. The reduction of nociceptive threshold means higher painful sensation. These methods have been used in studies of lameness in dairy cattle and disbudding process in calves.

Other useful indicators of pain based on behaviour are facial expressions. The facial expressions are a useful tool for

the identification and evaluation of pain in different species. Actually, there is not a well established pain scale in cattle, but there are studies that identify areas of the face that are modified when pain is present: ears, eyes, facials muscles and mussel.

**Facial expressions** are based in a codification system of facial appearance. It is an anatomical classification system used to map facial movements and facial muscles areas involved in facial contraction and relaxation. It has the capacity to encode and identify the pain expression through individual components of facial expressions, known as Facial Action Units (FAU).

The signs of pain that can be identified with facial expressions are low ear position, face and head muscular tension (mimic and masseters muscles), dilated nostrils, tense stare and the tension above the eyes. Figure 1 shows an image of calf whit signs of pain.

## Observation of behavioural and facial expressions are the most reliable method for pain evaluation

In some cases, only one behavioural indicator is sufficient to detect pain but the combination of more than one indicator increases probability to correctly detect and evaluate the intensity of pain. In fact, the most adequate way to pain evaluation is the use of scales which combine different kind of indicators. Table 1 shows behavioural, physiological and productive indicators attached to pain produced hours after of disbudding procedure.

● **TABLE 1: BEHAVIOURAL, PHYSIOLOGICAL AND PRODUCTIVE INDICATORS OF PAIN CAUSED BY DISBUDDING PROCEDURE**

| Behavioural indicators                                                                                                                |  |
|---------------------------------------------------------------------------------------------------------------------------------------|--|
| Indicate increase                                                                                                                     |  |
| Standing / Lying events / Tail shaking / Head shaking / Rubbing / Ear flicking / Kicking / Scratching / Vocalizations / Self-grooming |  |
| Indicate edecrease                                                                                                                    |  |
| Feeding / Rumination / Playing behaviour                                                                                              |  |
| Physiological and productive indicators                                                                                               |  |
| Indicate increase                                                                                                                     |  |
| Plasmatic cortisol / Salivary cortisol / Heart rate / Respiratory rate                                                                |  |
| Indicate edecrease                                                                                                                    |  |
| Weight gain                                                                                                                           |  |

### ● KEY MESSAGE

- Pain is a sensorial and emotional negative experience that has negative effects on animal welfare and production.
- Pain is evaluated by using productive, physiological and behavioural indicators and with facial expressions.
- The use of an scale combining different indicators is the most appropriated method to evaluation pain.

### REFERENCES

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