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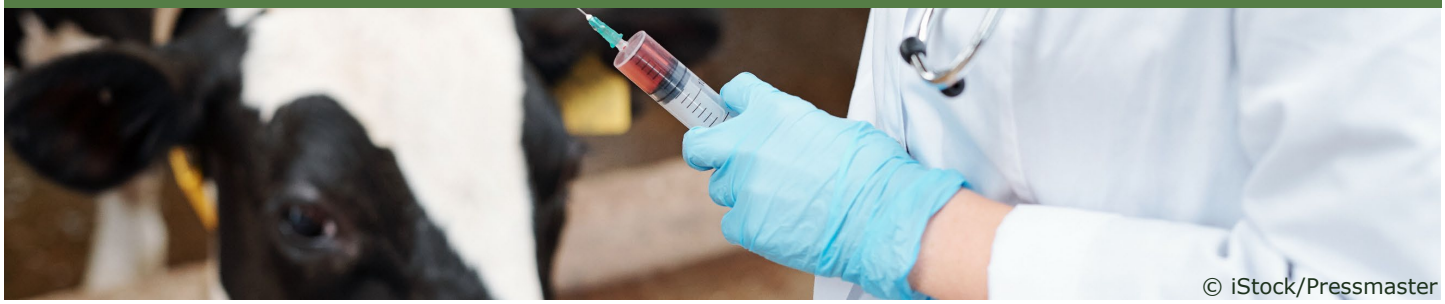
# Outcomes of painful and stressful procedures in cattle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## Introduction

Painful procedures in farm animals, i.e. non-therapeutic operations and procedures which involve interference with or the removal of sensitive tissue or bone structure of the animal, are common practice. The rationale behind such procedures, which may be carried out by farmers, other qualified farm personnel, or veterinarians is threefold: (1) identification purposes; (2) reducing the risk of injury to the animal, other animals or caretakers; and (3) commercial reasons, such as improving production efficiency or meat quality.

Frequently performed procedures in dairy and beef cattle include ***identification marking*** (e.g. ear-tagging, ruminal bolus, injectable transponder, branding, notching), ***disbudding*** (removal of the horn bud before it attaches to the skull), ***dehorning*** (removal of horn tissue after it is attached to skull), ***castration*** and less often ***spaying*** (i.e. female castration), ***tail docking***, ***teat clipping***, and ***nose ringing***. Handling during painful procedures is stressful for the animals and thus methods of restraint should be performed with care e.g. adopting low stress handling techniques and using appropriate equipment to restrain animals. All procedures should aim to minimise pain, stress and fear in the animals, as part of a good treatment.

Pain is defined by the International Association for the Study of Pain as *"An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage."* (Raja et al., 2020) and is expressed through behaviour including: (1) during the procedure: defensive behaviours (e.g. kicks), withdrawal, and vocalisation; (2) after the procedure: changes in postures (e.g. lowered head, arched back, extended legs), in facial expression (e.g. eyes wide open), increased stimulation (e.g. grooming) of the painful area, reduced feeding/ruminating activities, increased immobility, social withdrawal (e.g. reduced social interactions, increased distance to pen-mates). The type and intensity of behavioural changes depend upon the type of pain, its source, its location and its intensity. Pain may have long term effects on mental states (e.g. long-term stress, negative affective states and cognitive bias) and can be divided into three types, which should be considered when assessing outcomes of painful procedures:

- ***Acute nociceptive pain*** (intraoperative phase): response to initial tissue damage; can be inhibited or minimised using a combination of local/general anaesthesia; sedation alone is not sufficient to reduce acute pain but can be used to facilitate the procedure and lessening the force of handling;
- ***Inflammatory pain*** (response to tissue damage): persistent until tissue damage is resolved; increased pain sensitivity (hyperalgesia) during the healing process; can be alleviated by using analgesia (nonsteroidal anti-inflammatory drugs (***NSAID***s), opioids);
- ***Neuropathic pain*** (pain from nerve damage and dysfunction): occurs when the somatosensory system is damaged or has a dysfunction and can last indefinitely. It is possible that surgical procedures lead to neuroma development.

Any physical or mental suffering experienced by an animal are deemed unnecessary if it could reasonably have been prevented, reduced, or relieved through proper care, housing, handling, treatment, or humane practices, including the use of sedation, anaesthesia and analgesia as pain relief. Therefore, the primary aim must be to avoid or minimise the need for, the amount and consequences of painful and stressful procedures. In this context, the age of the animal should be

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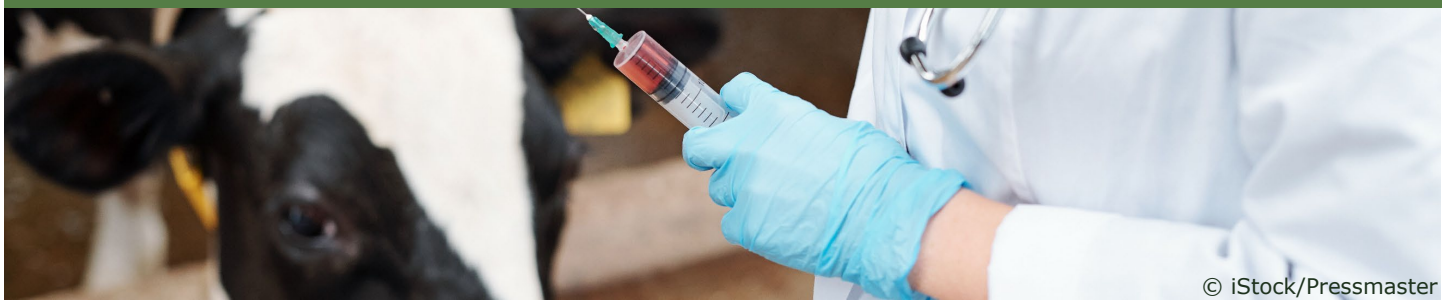


considered. Procedures carried out at a younger age may result in less tissue damage and a reduced inflammatory and acute stress response compared with the same procedures performed in older animals. Young animals (including neonates) are able to experience pain, therefore proper pain alleviation has to be given at any age. In addition, there is indication that painful experiences in neonates may lead to a systemic increase in pain sensitivity that may persist into adulthood. Outcome measures (e.g. tissue damage, inflammation, behavioural responses/changes, physiological measures) may be used to assess the impact of such procedures and the according handling/restraint.

## Legal requirements

Regarding painful procedures, Council Directive 98/58/EC of 20 July 1998 concerning the protection of animals kept for farming purposes states that relevant national provisions shall apply, resulting in a wide range of different regulations across Member States. Accordingly, owners or keepers are responsible that animals under their care are not caused any unnecessary pain, suffering or injury.

Legally binding on the contracting parties (EU Member States except EE, RO and SK), the Recommendation concerning Cattle adopted by the Standing Committee of the European Convention for the Protection of Animals kept for Farming Purposes on 21 October 1988, published by the Council of Europe, provides some specifications with regard to painful procedures in cattle (see chapter 'Council of Europe Cattle Welfare Recommendations' on page 15). For example, details are provided for procedures resulting in the loss of a significant amount of tissue, procedures in which the animal will or is likely to experience considerable pain, and the marking of cattle for identification.

## Method

Current production systems involve painful and stressful procedures for farm animals. However, in best-practice scenarios negative affective states (incl. pain) can be reduced through a combination of habituation to handling, sedation, anaesthesia and analgesia, which is from a welfare point of view strongly advised. When deciding whether a procedure should be carried out, it needs to be determined:

- if the expected result can be achieved by other procedures, and
- if the method chosen is the least painful to the animal.

In addition to pain due to the procedure, the stress aspects induced by handling, social isolation and restraint should be reduced.

Further considerations:
- Is more than one procedure performed at the same time?
- Is the procedure performed in healthy animals only?
- Is the procedure performed during a stressful period such as weaning?

Human or mechanical handling is required during painful procedures, which may induce stress and/or negative affective states, such as pain and fear, in animals, potentially with longer-term effects. However, outcome measures indicating handling stress in cattle may predominantly be assessed during handling with only limited possibility to assess effects post-handling.

Details on outcomes of painful and stressful procedures are provided in the ***Thematic Factsheet 'Outcomes of painful and stressful procedures in cattle'***.

# Recommendation for inspection

Based on the legal requirement that animals kept for farming purposes are not caused any unnecessary pain, suffering or injury, the use of local/general anaesthesia in combination with post-surgical analgesia (e.g. NSAIDs) is strongly advised to minimise acute and inflammatory pain associated with the discussed management practices. Additionally, welfare impairments due to handling stress may be reduced by sedating animals. Farm records shall be checked since animal owners are required by law to maintain a record of any medicinal treatment given.

Various methods are used to implement the painful procedures. Often, scientific evidence supports the utilisation of a specific method that least compromises animal welfare (Table 1). Nevertheless, the fundamental principle to adapt the housing system to the animal and not vice versa should be given priority.

*Table 1: Painful procedures and considerations regarding the recommended method or alternative measures for achieving the desired result.*

| Procedure | Recommended method or alternative measures for achieving the desired result |
|---|---|
| Identification marking | The legally required identification marking (conventional ear tag, electronic ear tag, ruminal bolus and injectable transponder) shall be considered sufficient for animal identification. Particular focus should be on minimising mechanical irritation, wounds and discomfort. If additional identification is required, non-invasive alternatives (e.g. collar) shall be preferred. |
| Disbudding | Scientific evidence suggests that thermocautery (hot-iron disbudding) is the least painful method used for disbudding calves. |
| Dehorning | Disbudding younger animals shows less welfare consequences and should be preferred over dehorning older/adult animals. |
| Castration | When keeping intact males is not feasible, surgical castration is suggested to be the least welfare-compromising method compared to the application of Burdizzo clamps or rubber rings |
| Spaying | Spaying shall be avoided. If herd management requires sterile cows, some evidence suggests that transvaginal spaying of heifers may have less impact on animal welfare. |
| Tail docking | Tail docking is prohibited in all EU Member States but it may be carried out in individual animals for veterinary medical reasons. Tail-tip resection is still allowed in Austria and Germany as a management practice under certain conditions. Switch-trimming is an effective alternative for preventing issues associated with dirty tails. Tail-tip injuries in beef cattle shall be prevented by improved housing conditions and lower stocking densities. |
| Teat clipping | Procedures resulting in the loss of a significant amount of tissue shall be forbidden according to Recommendation concerning Cattle adopted by the Standing Committee of the European Convention for the Protection of Animals kept for Farming Purposes. Since supernumerary teats are highly heritable, breeding programmes should select against them. |
| Nose ringing | Shall only be performed on breeding bulls, if necessary. Non-invasive rings are recommended. Septum-perforating nose ringing is an unnecessary procedure for cows. |

If farm inspections are carried out during or after the time of the painful procedures, generic and wound-specific behaviours that indicate pain may be observed (Table 2).

*Table 2: Animal categories and corresponding behaviours indicative of pain.*

| Animal category | Examples of behaviours that indicate pain |
|---|---|
| Cattle | Kicking, falling, tail flicking, ear flicks, head shakes, head rubbing, increased respiratory rate, increased heart rate, altered standing posture, standing head down, alternate lifting of hindlegs, site-oriented behaviour/self-licking, restlessness, decreased stride length, vocalisation, reduced feed intake, decreased rumination, decreased activity, escape attempts |
| Calves | Reduced play, abnormal postures, kicking/leg lifts, ear flicks, tail flicking, body flinches, head movements/shaking, wound-directed behaviour, increased sleep and sucking, place aversion, increased respiratory and heart rate |

Human or mechanical handling is required during painful procedures and may induce stress and/or negative affective states such as pain and/or fear in animals. Animal-based outcome measures indicating handling stress in cattle (EFSA Panel on Animal Health and Welfare, 2025) are summarised in Table 3.

*Table 3: Animal-based outcome measures for the assessment of handling stress.*

| Animal-based measure[1] | Definition and interpretation |
|---|---|
| Avoidance distance | Percentage of animals that can be touched by an approaching observer, or cannot be touched but can be approached up to a certain distance (< 50 cm, 50–100 cm, > 100 cm), in a standardised test at group level<br><br>Increased avoidance distance indicates either infrequent handling or negative past experiences during human-animal interactions, including handling |
| Slipping | Loss of balance in which the animal loses its foothold, or one or more hooves slide unintentionally over a short distance on the floor and no other body parts except hooves and/or legs are in contact with the floor surface<br><br>Cattle may slip as a result of aversive handling, behaviour of other animals, slippery ground, slope or obstacles |
| Falling | Unintentional loss of balance that leads to postural instability and in which part(s) of the body, other than the feet and legs, are in contact with the floor surface<br><br>Cattle may fall as a result of aversive handling |
| Freezing | Freezing is defined as when the route is free in front or behind the animal but the animal refuses to move forward or backwards within 4 s from being touched/coerced by the handler. If an animal takes more than one step and then stops, or moves backwards, another 'freeze' is recorded when the handler makes a new attempt to drive it forward. An animal that stops but continues to walk when the handler drives it forward is not frozen<br><br>Cattle may freeze as a fear response to handling |
| Moving backwards | Moving backwards is defined as when the animal moves backwards, by itself or as a reaction to handling. When an animal takes a few steps backwards to achieve balance or changes position in relation to other animals when crowding, it is not considered as moving backwards<br><br>Cattle may move backwards as a fear response to handling |

[1]Except for avoidance distance, all listed animal-based measures can only be assessed during handling.

*Table 3, continued: Animal-based outcome measures for the assessment of handling stress.*

| Animal-based measure[1] | Definition and interpretation |
|---|---|
| Vocalisation | Frequency of open-mouth vocalisations with inhalation between two occurrences, i.e. of mooing and bellowing<br><br>Increased handling stress is indicated by increased frequency of vocalisations |
| Respiratory rate or occurrence of panting | Frequency of breathing, usually measured by counting the movements of the flank through direct observation and converting it into number of breaths per minute. Panting is accompanied by a decrease in tidal volume and can be measured through a 5-point score: 0 – normal respiration; 1 – elevated respiration; 2 – moderate panting and/or presence of drool or small amount of saliva; 3 – heavy open-mouth panting; saliva usually present; 4 – severe open-mouth panting accompanied by protruding tongue and excessive salivation; usually with neck extended forward<br><br>Increased handling stress is indicated by an increased respiratory rate or the occurrence of panting as result of high physical activity |

[1]Except for avoidance distance, all listed animal-based measures can only be assessed during handling.

## References

Schenkenfelder, J., & Winckler, C. (2026). Thematic Factsheet – Outcomes of painful and stressful procedures. EURCAW *Ruminants & Equines*. https://doi.org/10.5281/zenodo.12792927