



Outcomes of painful and stressful procedures in cattle



© iStock/Pressmaster



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 (**NSAIDs**), 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



Outcomes of painful and stressful procedures in cattle



© iStock/Pressmaster

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 (including 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.

The **Indicator Factsheet 'Outcomes of painful and stressful procedures in cattle'** provides further information on their assessment.

Focus areas for inspection

With respect to the procedures applied in livestock husbandry, it is recommended to focus on the following areas:

- Farm records regarding application of sedation, anaesthesia, and analgesia during painful (surgical) procedures
- Signs of post-operative pain (e.g. behavioural changes such as increased restlessness, head shaking, decreased rumination, abnormal posture, tissue sensitivity, wound-directed behaviour)
- Specific changes to the body (Figures 1–3) as a direct consequence of the procedure (e.g. absence of horn buds, presence of nose rings, identification tags on ears, identification marks on other body parts, testicles)
- Presence of appropriate handling facilities and equipment



Figure 1: a) Hot-iron disbudding of a calf and b) Fresh disbudding wound. ©DE BOYER DES ROCHES, Alice



Figure 2: Septum-perforating nose ring in dairy cows. ©BOKU/TREMETSBERGER, Lukas

Figure 3: Tissue growth associated with ear-tagging of a calf. ©UC DAVIS/DRWENCKE, Alycia

Identification marking required by law

In EU legislation, each Member State must establish a system for the identification and registration of individual bovine animals. To this end, four different means of identification are listed in the Annex of Regulation (EU) No 653/2014. All animals on a holding need to be identified by at least two means of identification. If additional identification is required, non-invasive alternatives (e.g. collar) shall be preferred.

Table 1: Methods for legally required identification marking and their associated welfare outcomes.

Procedure	Reasoning	Method	Associated welfare outcomes and indicators	Note
Identification marking	Required by legislation that individual animals must be identifiable	Conventional/ electronic ear tag ¹	Pain, immediate damage beyond the hole itself; presence of tissue types related to piercing trauma or mechanical irritation and inflammation: red and swollen, impressions, crust, skin shedding, exudate, tissue growth;	By law, animals shall be identified by two means of identification, while one means shall be visible and bear a visible identification code
		Ruminal bolus	behavioural and physiological responses during ear tagging procedures indicative of pain and/or stress: increased heart rate, increased respiratory rate, tail flicking, head shaking Possible abnormal growth of ruminal mucosa due to mechanical friction or compression but cell layers remain intact in affected area;	Use of boluses with a diameter ≤ 20 mm recommended for identification of young calves (< 20 days); bolus length and specific gravity are key characteristics for maximum retention rate
		Injectable dermal transponder	physiological response to application of ruminal bolus: increased number of regurgitations due to physical stimulation of mechanoreceptors in the reticulum Pain, small damage to dermis and epidermis due to injection, local, temporary defence reaction of the animal, visible as a thin layer of connective tissue forms around the implant, possible inflammation	Potentially less painful than other methods due to less tissue damage

¹Conventional ear tags and electronic ear tags are each considered to be a distinct means of identification.

Identification marking for management

In addition to the legally required identification marking of cattle, which at least causes damage and irritation to the ear (see Table 1 – conventional/electronic ear tag), other identification methods to facilitate cattle management are known to be used. With respect to the provision that animals are not caused any unnecessary pain, suffering or injury, the following methods shall only be applied in cases where unambiguous permanent identification of individual animals cannot be achieved by other methods (e.g. animal disease control).

Table 2: Methods for management related identification marking and their associated welfare outcomes.

Procedure	Reasoning	Method	Associated welfare outcomes and indicators	Note
Identification marking	Facilitation of cattle management and handling	Hot-iron branding	Significant pain, second- or third-degree burn, inflammatory response behavioural pain responses during branding include tail flicking, kicking, falling, escape attempts, vocalisation	Should be avoided where possible; prolonged inflammatory response in hot-iron branding compared to freeze-branding indicates more tissue damage and more discomfort may be associated with hot-iron branding; brand wounds take ≥ 8 weeks to heal and remain more painful than unbranded tissue at least 10 weeks afterwards; a single injection of NSAID has no measurable effect in mitigating pain associated with branding
		Freeze branding	Significant pain, second- or third-degree burn, inflammatory response	Should be avoided where possible. Freeze branding may be less painful than hot-iron branding, but is time-consuming to perform which prolongs the perceived stress for the animal
		Notching	Significant pain, immediate tissue damage, risk for infection, inflammation	Should be avoided where possible, but may be carried out if required or allowed by national legislation

Disbudding

Disbudding results in significant acute pain and describes the removal of the free-floating horn bud before it attaches to the skull at approximately 2 months of age. It is usually performed using one of the methods listed in Table 3, in order to reduce the risk of injuries to animals during housing or transport, reduce damage to facilities, and make handling safer. Alternatives to disbudding are breeding polled cattle or adapting management and husbandry systems for intact, horned animals.

Table 3: Methods for disbudding and their associated welfare outcomes.

Procedure	Reasoning	Method	Associated welfare outcomes and indicators	Note
Disbudding (calves aged < 2 months)	Facilitation of cattle management and handling (reduced risk of injuries of animals and handlers)	Hot-iron (thermocautery)	Significant pain, burns, necrotic tissue, exudate, granulation, crust, scarring behaviours associated with postoperative pain: ear flicks, head shakes, head rubbing, decreased feeding and rumination and activity, increased sleep and sucking	Recommended method if disbudding is carried out; no evidence that conducting the procedure shortly after birth is less painful; hyperalgesia during healing; possible generalised long-term increase in pain sensitivity if performed near birth; risk of horn regrowth if not carried out correctly
		Caustic paste (chemical cauterisation)	Attached/ detaching necrotic tissue, exudate, granulation, crust, new epithelium; inflammatory pain, prolonged healing time, horn regrowth, injuries from chemical run-off, isolation stress pain-related behaviours: head shakes and rubs, reduced play, and place aversion	No evidence that this method is less painful than thermocautery but it is more difficult to manage (runoff, need for isolating calves) and slower to heal (approx. 18 weeks) than thermocautery (7–9 weeks); risk of horn regrowth if not carried out correctly
		Scoop, knife, or tube (surgical removal)	Significant pain, crust, scarring, risk of inflammation, risk of bleeding pain-related behaviours: ear flicks, head shakes, head rubbing, decreased feeding and rumination and activity, vocalisation, restlessness	There is evidence to suggest that this method is more painful than thermocautery; complete removal of the corium and a hair ring surrounding the horn bud required to prevent horn regrowth

Dehorning

Dehorning is the removal of an animal's horn after it attaches to the skull at about 2 months of age. As with disbudding, it aims to reduce the risk of injuries to animals during housing or transport, reduce damage to facilities, and make handling cattle safer. The amputation of horns in adult cattle leaves an open cavity that extends into the frontal sinuses and takes about 4–8 weeks to heal. Alternatives to the procedure include disbudding, adapting husbandry systems to horned animals or keeping polled cattle.

Table 4: Method for dehorning and associated welfare outcomes.

Procedure	Reasoning	Method	Associated welfare outcomes and indicators	Note
Dehorning (calves aged > 2 months)	Facilitation of cattle management and handling (reduced risk of injuries of animals and handlers)	Surgical	<p>Significant pain, large open wound with opening of cranial cavity (depending on the age of the animal), sinus infection, intense bleeding, hyperalgesia during healing, bone fractures</p> <p>behaviours associated with postoperative pain: ear flicks, head shakes, head rubbing, decreased feeding and rumination and activity, restlessness, abnormal posture, vocalisation</p>	More invasive than disbudding and should therefore be avoided

Castration

Animals are commonly castrated to improve meat quality by increasing intramuscular fat (i.e. marbling) and to decrease aggressive and sexual behaviour, which otherwise may increase the risk of injuries in both humans and animals. Occurrence of stress and bruising at slaughter, which can negatively impact meat quality (e.g. dark cutting beef), is lower in steers. Immunocastration is currently not approved in the EU for cattle but would prevent pain associated with other means of castration. Alternatives to castration are adapting management and husbandry systems for intact males.

Table 5: Methods for castration and their associated welfare outcomes.

Procedure	Reasoning	Method	Associated welfare outcomes and indicators	Note
Castration	Facilitation of cattle management and handling, meat quality	Surgical	Significant pain, wounds are inflamed for 1 to 3 weeks, and it takes 11 weeks for the incisions to heal, speed of healing of the internal injuries caused by pulling on the spermatic cords is unknown; swelling, oedema, risk of tetanus infection; behavioural pain responses: kicking, vocalisations, restlessness, decreased stride length, altered standing/resting postures, changes in activity, reduced feeding and ruminating	Recommended method if castration is carried out; not completely clear whether there is an age effect on intensity of pain perception, but healing is quicker in young animals due to smaller wound size
		Burdizzo clamp	Significant pain, swelling, oedema, risk of tetanus infection behavioural pain responses: kicking, vocalisations, abnormal standing/resting posture, reduced activity and locomotion, reduced feeding and ruminating, site-oriented behaviour	Place second crush of the Burdizzo clamp distal to the first to reduce pain experienced by the animal; some testes still palpable 60 days after application, castration may be incomplete
		Rubber ring/banding	Swelling, oedema, risk of tetanus infection; scrotum detaches after 2–9 weeks, resultant wounds sometimes quite large and may take several (7–10) weeks to heal; pain response: site-oriented behaviour, alternate lifting of hindlegs, abnormal postures, slow movements of tail observed for weeks after castration	Superficial wounds from rubber ring/latex band castration heal slower than those from surgical castration; rubber ring castration not for use in older cattle

Spaying

Preferably, husbandry systems and management should be adapted to animals, allowing natural hormone levels and behaviour. However, spaying female cattle is sometimes used to prevent unwanted pregnancies, particularly in heifers in extensive husbandry systems such as rangelands, to avoid calving difficulties and to improve daily weight gain.

Table 6: Methods for spaying and their associated welfare outcomes.

Procedure	Reasoning	Method	Associated welfare outcomes and indicators	Note
Spaying (ovariectomy, female castration)	Facilitation of cattle management and handling (prevention of unwanted pregnancies, improved weight gains)	Transvaginal (dropped ovary technique: transvaginal separation of the ovaries from their blood supply, ovaries remain in abdominal cavity)	Significant pain; risks of blood and productivity loss, risk of perforation of viscera; behaviour indicating pain: reduced feeding, standing head down, self-licking behaviours	Compared to flank spaying, may cause less pain and stress, reduced infection risk, faster recovery; some evidence suggests less impact on welfare when spaying heifers compared to cows, still causing significant pain and distress
		Flank laparotomy (ovaries are surgically removed through an incision in the flank or, alternatively, a portion of the oviduct (fallopian tube) is removed from each side in a process known as 'webbing')	Significant pain; incision, risks of wound infection, spreading of blood borne diseases and death; behaviour indicating pain: kicking/leg lifts, tail flicks, body flinches, head movements, vocalisation	

Tail docking

Amputation of the tail, except for veterinary medical treatment, is prohibited in all EU Member States. Tail-tip resection, i.e. the tendinous part of the tail, however, is still allowed in Austria and Germany as a management practice under certain conditions. Some dairy farmers believe that tail docking enhances cleanliness around the udder, thereby reducing the risk of mastitis and improving milk hygiene and quality. However, there is no scientific evidence to support these claims. So-called 'switch trimming' (cutting the long hair at the end of the tail) of dairy cows is an effective alternative for preventing issues associated with dirty tails. In beef cattle, tail-tip resection is suggested to reduce the risk of tail-tip injuries and necrosis caused by trampling on the tail which is mostly observed in indoor housing systems on concrete slatted floors at high stocking densities.

The Recommendation concerning Cattle adopted by the Standing Committee of the European Convention for the Protection of Animals kept for Farming Purposes states that tail docking shall be forbidden (with the exception of procedures performed for veterinary medical purposes). Also, for fattening bulls the recommendation explicitly mentions that *"If tail tip inflammation or signs of abnormal behaviour appear, the husbandry system should be improved, for instance, by reducing the stocking density, avoiding barren environment, enriching the diet with roughage, improving the floor quality and the climatic and hygienic conditions."*

Table 7: Methods for tail docking and their associated welfare outcomes.

Procedure	Reasoning	Method	Associated welfare outcomes and indicators	Note
Tail docking (tail-tip resection)	Facilitation of cattle management	Surgical	Significant pain, soft tissue lesions, integument damage, resting problems, inability to perform comfort behaviour;	Must be avoided by improving housing conditions and management
		Elastic banding	Significant pain, soft tissue lesions, integument damage, resting problems, inability to perform comfort behaviour; behaviour indicating pain: head movements directed towards the tail, more and shorter resting bouts;	Must be avoided by improving housing conditions and management
		Hot-iron docking	Significant pain, soft tissue lesions, integument damage, resting problems, inability to perform comfort behaviour;	Must be avoided by improving housing conditions and management; less intense reactions indicative of pain than band/rubber ring tail docking

Teat clipping

Dairy cattle may be born with additional teats on their udders, known as supernumerary teats. While many of these are non-functional and harmless, some contain glandular tissue or are connected to functional teats, which can increase the risk of infection and mastitis. In breeding animals, supernumerary teats are an undesirable trait and are also removed for aesthetic reasons. This is typically performed using surgical scissors. Since supernumerary teats are highly heritable, breeding programmes should select against them to reduce their prevalence. As teats are highly vascularised and sensitive, their removal causes severe pain to the animal.

Table 8: Method applied for teat clipping and associated welfare outcomes.

Procedure	Reasoning	Method	Associated welfare outcomes and indicators	Note
Teat clipping (removal of supernumerary teats)	Management, aesthetics	Surgical	Significant pain, incision, risks of wound infection, inflammation	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

Nose ringing

Nose ringing involves inserting a metal ring into the nose or nasal septum (the cartilage between the nostrils) of cattle to help manage and control large animals, mainly bulls, for the sake of safety of their handlers. It shall not be used to lead an animal until the septum is healed. For cows, the proper use of a removable show lead in combination with a suitable head halter is an alternative to nose rings.

Table 9: Method applied for nose ringing and associated welfare outcomes.

Procedure	Reasoning	Method	Associated welfare outcomes and indicators	Note
Nose ringing bulls	Safety in managing and handling (particularly leading of breeding bulls)	Surgical	Significant pain, incision, risks of wound infection	An unnecessary procedure for cows

Legal requirements

The legal requirements referred to are based on EU legislation. National regulations in EU Member States may apply stricter requirements.

Council Directive 98/58/EC of 20 July 1998 concerning the protection of animals kept for farming purposes

"Member States shall make provision to ensure that the owners or keepers take all reasonable steps to ensure the welfare of animals under their care and to ensure that those animals are not caused any unnecessary pain, suffering or injury."

(Article 3)

"Animals shall be cared for by a sufficient number of staff who possess the appropriate ability, knowledge and professional competence."

(Annex, 1.)

"Any animal which appears to be ill or injured must be cared for appropriately without delay and, where an animal does not respond to such care, veterinary advice must be obtained as soon as possible. Where necessary sick or injured animals shall be isolated in suitable accommodation [sic] with, where appropriate, dry comfortable bedding."

(Annex, 4.)

"The owner or keeper of the animals shall maintain a record of any medicinal treatment given and of the number of mortalities found to each inspection."

(Annex, 5.)

"Pending the adoption of specific provisions concerning mutilations in accordance with the procedure laid down in Article 5, and without prejudice to Directive 91/630/EEC, relevant national provisions shall apply in accordance with the general rules of the Treaty."

(Annex, 19.)

Regulation (EC) No 1760/2000 of the European Parliament and of the Council of 17 July 2000 establishing a system for the identification and registration of bovine animals and regarding the labelling of beef and beef products and repealing Council Regulation (EC) No 820/97

"Each Member State shall establish a system for the identification and registration of bovine animals, in accordance with this Title."

(Article 1, 1.)

"The system for the identification and registration of bovine animals shall comprise the following elements:

(a) ear tags to identify animals individually; [...]"

(Article 3)

"All animals on a holding born after 31 December 1997 or intended for intra-Community trade after 1 January 1998 shall be identified by an ear tag approved by the competent authority, applied to each ear. Both ear tags shall bear the same unique identification code, which makes it possible to identify each animal individually together with the holding on which it was born."

(Article 4, 1.)

"The ear tag shall be applied within a period to be determined by the Member State as from the birth of the animal and in any case before the animal leaves the holding on which it was born. The period may not be longer than 30 days up to and including 31 December 1999, and not longer than 20 days thereafter."

(Article 4, 2.)

Regulation (EU) No 653/2014 of the European Parliament and of the Council of 15 May 2014 amending Regulation (EC) No 1760/2000 as regards electronic identification of bovine animals and labelling of beef

“Regulation (EC) No 1760/2000 is amended as follows: [...]

(3) in the first paragraph of Article 3, point (a) is replaced by the following: “(a) means of identification to identify animals individually;”

(Article 1, (3))

“All animals on a holding shall be identified by at least two means of identification listed in Annex I and in compliance with rules adopted pursuant to paragraph 3 and approved by the competent authority. At least one of the means of identification shall be visible and bear a visible identification code. [...]

(Article 1, (4), ‘Article 4, 1.)

“The means of identification provided for in Article 4(1) shall be applied to the animal before the expiry of a maximum period, to be determined by the Member State in which the animal was born. The maximum period shall be calculated from the date of birth of the animal and shall not exceed 20 days.

By way of derogation from the first subparagraph, for reasons related to the physiological development of the animals, that period may, for the second means of identification, be extended up to 60 days following the birth of the animal. [...]

(Article 1, (4), ‘Article 4a, 1.)

“MEANS OF IDENTIFICATION

A) CONVENTIONAL EAR TAG

WITH EFFECT FROM 18 JULY 2019:

B) ELECTRONIC IDENTIFIER IN THE FORM OF AN ELECTRONIC EAR TAG

C) ELECTRONIC IDENTIFIER IN THE FORM OF A RUMINAL BOLUS

D) ELECTRONIC IDENTIFIER IN THE FORM OF AN INJECTABLE TRANSPONDER”

(Article 1, (23), ‘Annex I)

Council of Europe Cattle Welfare Recommendations

The Recommendation concerning Cattle adopted by the Standing Committee of the European Convention for the Protection of Animals kept for Farming Purposes presents an important expert opinion which is legally binding on the contracting parties (all EU Member States except Estonia, Romania and Slovakia). National regulations in EU Member States may apply stricter requirements.

Recommendation Concerning Cattle adopted by the Standing Committee of the European Convention for the Protection of Animals kept for Farming Purposes (T-AP) on 21 October 1988

“Procedures resulting in the loss of a significant amount of tissue, or the modification of bone structure of cattle shall be forbidden, and in particular:

- a. tongue modification or mutilation;
- b. dehorning by other means than the surgical removal of the horns;
- c. docking of tails;”

(Article 17, 1.)

“Exceptions to the prohibitions under paragraph 1 may be made:

- a. for procedures performed for veterinary medical purposes;
- b. for the following procedures which can be performed only in the interest of the animals or when necessary for the protection of people in close contact with the animals, and on the conditions set out in paragraphs 3 and/or 4 hereafter;
 - i. destruction or removal of the horn producing area at an early stage (disbudding) to avoid dehorning;
 - ii. dehorning, if performed by surgical removal of the horns;
 - iii. nose ringing bulls and cows.
- c. for the following procedures which should be avoided where possible, but may be carried out in accordance with paragraphs 3 or 4 hereafter and on the following conditions:
 - i. castration of bulls and bull-calves, preferably by the surgical removal of the testicles but not by methods which cause unnecessary or prolonged pain and distress;
 - ii. spaying of fattening cows, if allowed by domestic legislation;
 - iii. notching or punching of animals’ ears if required or allowed by domestic legislation.”

(Article 17, 2.)

“Procedures in which the animal will or is likely to experience considerable pain shall be carried out under local or general anaesthesia by a veterinary surgeon or any other person qualified in accordance with domestic legislation. These procedures include spaying, dehorning and disbudding by surgical means or by heat cauterisation on animals over four weeks of age and should include castration and vasectomy.”

(Article 17, 3.)

“Procedures for which no anaesthesia is required shall be performed on animals in a way so as to avoid unnecessary or prolonged pain or distress. Such procedures may be carried out by a skilled operator, and include, on the conditions set out in paragraph 2 above:

- a. destruction or removal of the horn producing area of animals under four weeks of age:
 - i. by chemical cauterisation;
 - ii. by heat cauterisation on the condition that it is done with an instrument which produces sufficient heat for at least ten seconds;
- b. nose ringing bulls and cows;
- c. notching or punching of animals’ ears.”

(Article 17, 4.)

“The marking of cattle for identification should be done with care by competent operators so as to avoid unnecessary pain or distress to the animals at the time of marking or subsequently.

In particular toxic materials should be prohibited and caustic paste or hot irons shall only be used when an absolutely permanent identification for special purposes (for example animal disease control) cannot be achieved by other methods.”

(Article 18, 1.)

“If tail tip inflammation or signs of abnormal behaviour appear, the husbandry system should be improved, for instance, by reducing the stocking density, avoiding barren environment, enriching the diet with roughage, improving the floor quality and the climatic and hygienic conditions.”

(Appendix A, 8.)



References

- Adcock, S. J. J., & Tucker, C. B. (2018a). Painful procedures: When and what should we be measuring in cattle? *Advances in Cattle Welfare*, 157–198. <https://doi.org/10.1016/B978-0-08-100938-3.00008-5>
- Adcock, S. J. J., & Tucker, C. B. (2018b). The effect of disbudding age on healing and pain sensitivity in dairy calves. *Journal of Dairy Science*, 101(11), 10361–10373. <https://doi.org/10.3168/JDS.2018-14987>
- Adcock, S. J., Downey, B. C., Owens, C., & Tucker, C. B. (2023). Behavioral changes in the first 3 weeks after disbudding in dairy calves. *Journal of Dairy Science*, 106, 6365–6374. <https://doi.org/10.3168/jds.2023-23237>
- Antonini, C., Trabalza-Marinucci, M., Franceschini, R., Mughetti, L., Acuti, G., Faba, A., Asdrubali, G., & Boiti, C. (2006). In vivo mechanical and in vitro electromagnetic side-effects of a ruminal transponder in cattle. *Journal of Animal Science*, 84(11), 3133–3142. <https://doi.org/10.2527/jas.2006-136>
- De Boyer des Roches A, Colson V, Guatteo R, Terlouw C, Barrière DA, Boitard P-M, et al. (2025). Vers une meilleure gestion de la douleur des mammifères et poissons destinés à la consommation humaine – Partie 1 : Concepts, mécanismes, causes, détection. INRAE Productions Animales, 38:9398. <https://doi.org/10.20870/productions-animales.2025.38.4.9398>.
- Drwencke, A. M., Adcock, S. J. J., & Tucker, C. B. (2023). Wound healing and pain sensitivity following caustic paste disbudding in dairy calves. *Journal of Dairy Science*, 106(9), 6375–6387. <https://doi.org/10.3168/JDS.2023-23238>
- EFSA Panel on Animal Health and Welfare. (2025). Welfare of beef cattle. *EFSA Journal*, 23(7). <https://doi.org/10.2903/j.efsa.2025.9518>
- Ghirardi, J. J., Caja, G., Garín, D., Casellas, J., & Hernández-Jover, M. (2006). Evaluation of the retention of electronic identification boluses in the forestomachs of cattle. *Journal of Animal Science*, 84(8), 2260–2268. <https://doi.org/10.2527/jas.2005-758>
- Grandin, T. (2018). Livestock-handling assessments to improve the welfare of cattle, pigs and sheep. *Animal Production Science*, 58(3), 403–407. <https://doi.org/10.1071/AN16800>
- Guatteo, R., Levionnois, O., Fournier, D., Guémené, D., Latouche, K., Leterrier, C., Mormède, P., Prunier, A., Serviàre, J., Terlouw, C., & Le Neindre, P. (2012). Minimising pain in farm animals: the 3S approach – ‘Suppress, Substitute, Soothe.’ *Animal*, 6(8), 1261–1274. <https://doi.org/10.1017/S1751731112000262>
- Harmon, M. L., Downey, B. C., Drwencke, A. M., & Tucker, C. B. (2023). Development and application of a novel approach to scoring ear tag wounds in dairy calves. *Journal of Dairy Science*, 106(7), 5043–5053. <https://doi.org/10.3168/JDS.2022-23005>
- Klindtworth, M., Wendl, G., Klindtworth, K., & Pirkelmann, H. (1999). Electronic identification of cattle with injectable transponders. *Computers and Electronics in Agriculture*, 24(1–2), 65–79. [https://doi.org/10.1016/S0168-1699\(99\)00037-X](https://doi.org/10.1016/S0168-1699(99)00037-X)
- Lauder, J. K., Marti, S., Schwartzkopf-Genswein, K. S., Jelinski, M. D., & Janzen, E. D. (2020). Measuring behavioral and physiological responses to pain mitigation for ovarietomy in *Bos taurus* yearling beef heifers. *Journal of Animal Science*, 98(1), 1–12. <https://doi.org/10.1093/jas/skz386>
- Løken, T., Vatn, G., & Kummen, E. (2011). Subcutaneous electronic identification in cattle: a field study. *Veterinary Record*, 169(10), 250. <https://doi.org/10.1136/vr.d2789>
- Marquette, G. A., Ronan, S., & Earley, B. (2023a). Calf disbudding – animal welfare considerations. *Journal of Applied Animal Research*, 51(1), 616–623. <https://doi.org/10.1080/09712119.2023.2264912>
- Marquette, G. A., Ronan, S., & Earley, B. (2023b). Review: castration – animal welfare considerations. *Journal of Applied Animal Research*, 51(1), 703–718. <https://doi.org/10.1080/09712119.2023.2273270>
- Marti, S., Meléndez, D. M., Pajor, E. A., Moya, D., Heuston, C. E. M., Gellatly, D., Janzen, E. D., & Schwartzkopf-Genswein, K. S. (2017). Effect of band and knife castration of beef calves on welfare indicators of pain at three relevant industry ages: II. Chronic pain. *Journal of Animal Science*, 95(10), 4367–4380. <https://doi.org/10.2527/jas2017.1763>
- Meléndez, D. M., Marti, S., Pajor, E. A., Moya, D., Heuston, C. E. M., Gellatly, D., Janzen, E. D., & Schwartzkopf-Genswein, K. S. (2017). Effect of band and knife castration of beef calves on welfare indicators of pain at three relevant industry ages: I. Acute pain. *Journal of Animal Science*, 95(10), 4352–4366. <https://doi.org/10.2527/jas2017.1762>
- Petherick, J. C., McCosker, K., Mayer, D. G., Letchford, P., & McGowan, M. (2013). Evaluation of the impacts of spaying by either the dropped ovary technique or ovarietomy via flank laparotomy on the welfare of *Bos indicus* beef heifers and cows. *Journal of Animal Science*, 91(1), 382–394. <https://doi.org/10.2527/jas.2012-5164>
- Pilot-Storck F, Kohlhauser M, Colson V, Guatteo R, Terlouw C, Barrière DA, et al. (2025). Vers une meilleure gestion de la douleur des mammifères et poissons destinés à la consommation humaine – Partie 2 : Prise en charge. INRAE Productions Animales, 38:9399. <https://doi.org/10.20870/productions-animales.2025.38.4.9399>.
- Pinner, K. K. R. (2006). Lack of animal welfare assessment regarding trans-vaginal spaying of heifers. *The Canadian Veterinary Journal*, 47(3), 266–272.
- Raja, S. N., Carr, D. B., Cohen, M., Finnerup, N. B., Flor, H., Gibson, S., Keefe, F. J., Mogil, J. S., Ringkamp, M., Sluka, K. A., Songil, X.-J., Stevensm, B., Sullivann, M. D., Tutelmano, P. R., Ushidap, T., & Vader, K. (2020). The revised International Association for the Study of Pain definition of pain: concepts, challenges, and compromises. *Pain*, 161(9), 1976–1982. <http://dx.doi.org/10.1097/j.pain.0000000000001939>
- Recommendation Concerning Cattle Adopted by the Standing Committee on 21 October 1988 (1988). <https://www.coe.int/en/web/cdcj/1988-rec-cattle>
- RSPCA Australia. (2022). *What are some of the painful procedures experienced by cattle on farm?* <https://kb.rspca.org.au/knowledge-base/what-are-some-of-the-painful-procedures-experienced-by-cattle-on-farm/>
- Schwartzkopf-Genswein, K. S., & Stookey, J. M. (1997). The use of infrared thermography to assess inflammation associated with hot-iron and freeze branding in cattle. *Canadian Journal of Animal Science*, 77(4), 577–583. <https://doi.org/10.4141/A97-019>



References, continued

- Stafford, K. J., & Mellor, D. J. (2005). The welfare significance of the castration of cattle: A review. *New Zealand Veterinary Journal*, 53(5), 271–278. <https://doi.org/10.1080/00480169.2005.36560>
- Tucker, C. B., Fraser, D., & Weary, D. M. (2001). Tail Docking Dairy Cattle: Effects on Cow Cleanliness and Udder Health. *Journal of Dairy Science*, 84(1), 84–87. [https://doi.org/10.3168/JDS.S0022-0302\(01\)74455-4](https://doi.org/10.3168/JDS.S0022-0302(01)74455-4)
- Tucker, C. B., Mintline, E. M., Banuelos, J., Walker, K. A., Hoar, B., Varga, A., Drake, D., & Weary, D. M. (2014). Pain sensitivity and healing of hot-iron cattle brands. *Journal of Animal Science*, 92(12), 5674–5682. <https://doi.org/10.2527/jas.2014-7887>



Designated by
the EU Commission

