

Best-practice recommendations for disbudding dairy goat kids

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Abstract

Cautery disbudding is a routine painful husbandry practice carried out on young goat kids using a hot cautery iron to destroy the horn buds and prevent horn growth. The objective of this review is to evaluate scientific literature on cautery disbudding of goat kids and discuss variation in practice including training, kid-related factors (e.g., age, sex), iron-related factors (e.g., temperature, application time), and pain mitigation in order to provide best-practice recommendations for cautery disbudding dairy goat kids. Goat kid-specific training is required to improve consistency across operators and reduce any harmful effects associated with cautery disbudding. The best age to disbud doe kids is approximately a week of age, but buck kids may be disbudded earlier (3 to 5 days). Cautery irons can range in temperature depending on power-source, age and brand, all of which should be taken into consideration when deciding on application time. Not more than 15 sec should be used, and ideal application time of the iron may be between 5 and 7 sec to cauterize and remove the horn bud. Removing the horn bud improves efficacy in preventing scurs. Isoflurane or dexmedetomidine and meloxicam can reduce pain associated with cautery disbudding, whereas lidocaine may not. Goat kid-focused best-practice recommendations for cautery disbudding can improve goat welfare.

Key words: welfare, cautery iron, goat kid, brain injury, disbudding alternative

Résumé

L'ébourgeonnage par cautérisation est une pratique d'élevage douloureuse faite chez des chevreaux avec un fer chaud cautérisant afin de détruire les bourgeons de corne et prévenir la croissance des cornes. L'objectif de cette revue est d'évaluer la littérature scientifique sur l'ébourgeonnage par cautérisation chez les chevreaux et de discuter de varia-

tion dans cette pratique incluant la formation, les facteurs liés au chevreau (e.g. âge, sexe), les facteurs reliés au fer (e.g. température, temps d'application) et l'atténuation de la douleur afin de fournir des recommandations de pratiques exemplaires pour l'ébourgeonnage par cautérisation chez les chevreaux laitiers. Une formation spécifique au chevreau est nécessaire pour améliorer l'homogénéité entre les opérateurs et réduire tout effet nocif associé à l'ébourgeonnage par cautérisation. Le meilleur moment pour ébourgeonner les chevreaux femelles est à une semaine d'âge approximativement mais les chevreaux mâles peuvent être ébourgeonnés plus tôt (3 à 5 jours). Le fer chaud peut varier en température dépendant de la source d'alimentation, de l'âge et de la marque et tous ces facteurs devraient être pris en compte lorsqu'on décide du temps d'application. Le temps d'application ne devrait pas dépasser 15 secondes et idéalement il devrait se situer entre 5 et 7 secondes pour cautériser et retirer le bourgeon de corne. Le retrait du bourgeon de corne permet une meilleure prévention d'excroissances de la corne. L'isoflurane ou la dexmédétomidine et le méloxicam peuvent réduire la douleur associée à l'ébourgeonnage par cautérisation ce qui n'est pas nécessairement le cas avec la lidocaïne. Des recommandations de pratiques exemplaires pour l'ébourgeonnage par cautérisation du chevreau peuvent améliorer le bien-être chez la chèvre.

Introduction

Cautery disbudding of young goat kids is routinely carried out to thermally destroy the horn bud cells and prevent horn growth.¹⁹ During agonistic interactions, horned goats can increase the risk of injuries to other animals and stock people as well as increase the amount of space required at the feed bunks.^{14,27} Cautery disbudding practices appear to be similar to those of calves,²⁸ which are larger at the time of disbudding, and with much thicker skulls. Cautery disbudding can result in physical damage to the skull and thermal and bacterial meningoencephalitis in goat kids;^{17,22,29} thus

care is required when disbudding goat kids, especially if the operator is accustomed to disbudding calves. Cautery disbudding is preferred over dehorning, which causes significantly more pain and tissue damage than disbudding; dehorning is required after the horn bud has fused with the frontal bone and a horn has formed.^{12,19}

In many countries, practices for disbudding goat kids are legislated or regulated. In the UK, only veterinary surgeons may perform disbudding and recently, it has been mandated that anesthesia must be used (either local or general) and that non-steroidal anti-inflammatory drugs (NSAIDs) such as meloxicam are recommended.^{2,24} Painful interventions require the use of local or general anesthesia and require operators to have received training to administer anesthesia and disbud kids in Switzerland.²⁶ In Australia, the operator must be skilled and knowledgeable on disbudding and cannot disbud after 6 months of age without pain mitigation.¹ In New Zealand, new standards on painful procedures came into effect in October 2019, declaring that only skilled operators can perform disbudding and that the method chosen must be used in a way to cause minimal damage to the surrounding skin.¹⁵ Additionally, local anesthetic must be used when disbudding calves,¹⁵ but the same is not stated for goat kids (likely due to lack of evidence that it is efficacious). Use of pain mitigation for cautery disbudding is recommended in Australia, New Zealand, Canada, and the United States, although no mandate for pain mitigation exists. The objective of this review is to evaluate scientific literature on cautery disbudding of goat kids and discuss variation in practice including training, kid-related factors (e.g., age, sex), iron-related factors (e.g., temperature, application time), and pain mitigation in order to provide best-practice recommendations for cautery disbudding dairy goat kids.

Cautery Disbudding Training

An adequate level of training should be provided for those responsible for disbudding goat kids; the level of training received in the United States is not well understood. In a recent survey of 30 dairy goat producers in the Midwest, 25 producers (~83%) disbudded their own goat kids and of those, 9 taught themselves to disbud (36%), 10 learned from relatives or friends (40%), and 6 were trained by veterinarians (24%) (Hempstead et al, unpublished data). These initial findings indicate that training received by those performing disbudding of goat kids is low, which may impact on injuries or mortalities associated with the practice. A New Zealand-based study that investigated kid rearing practices on 16 commercial dairy goat farms reported that of those that died and were necropsied, 15.9% (17/107) of kids died as a result of disbudding-related injuries, which was second only to gastrointestinal disorders (33.6%, 36/107).²³ Goat kid-specific training is vital in order to improve consistency across operators and reduce any negative consequences associated with the practice.

Animal-related Factors Affecting Disbudding Practice

It is recommended for goat kids to be disbudded before 2 weeks of age, ideally between 5 and 7 days, when the horn buds have not yet fused to the frontal bone.^{18,19} Studies evaluating pain associated with cautery disbudding utilized kids between the ages of 2 and 28 days (10.6 ± 5.7 days; mean ± SD).^{3,7,8} Factors such as breed and sex may impact the rate of horn bud development and should be considered when deciding the age to disbud goat kids. For example, it may be appropriate to disbud a Saanen doe kid at approximately 1 week old, whereas this may be too young for a pygmy breed, which may require disbudding at approximately 2 weeks of age.¹⁹ Buck kids generally require disbudding at an earlier age than for doe kids due to the precocious nature of horn growth in bucks (i.e. 3 to 5 days).¹⁹ Future research is required to evaluate the effect of kid age on pain, brain injury and efficacy.

Cautery Iron-related Factors Affecting Disbudding Practice

A hot cautery iron is most commonly used to disbud goat kids in studies evaluating pain.^{3,9,13} In a recent survey of 30 dairy goat producers in Midwest states, all producers reported that they used a cautery iron to disbud their kids (Hempstead et al, unpublished data). However, there is considerable variation in cautery iron use (i.e. power source, temperature reached and application time, horn bud removal).

Electric irons can range in temperature between 619°F (326°C) and 1112°F (600°C),^{13,16} whereas gas-powered irons can reach higher temperatures (1292°F or 700°C);⁵ therefore, care should be taken not to overuse the iron. Gas-powered irons are not limited to locations with a power supply, which may be beneficial when visiting a farm for the first time. Depending on the temperature of the iron (which may vary across the age or brand of the iron), the amount of time the iron is applied to the horn bud should be changed accordingly. For example, if the iron appears to be burning quickly, then the iron should be applied for a short time. The amount of time that the iron was in contact with the horn bud ranges from 4 to 30 sec (mean ± SD: 10.6 ± 5.1 sec).^{4,7,10} Brain injury caused by cautery disbudding may be associated with the length of time the iron is applied to the horn buds. In a recent pilot study, kids were allocated a different application time for each horn bud (on the same animal) and were disbudded using application timings of 5, 10, 15, and 20 sec per horn bud. Goat kids that received application times of 15 and 20 sec displayed evidence of brain injury (e.g., white matter edema crossing multiple gyri) corresponding with the area under the horn buds (3/4 kids; a further 2 kids' data is pending assessment; Hempstead et al, unpublished data). These results suggest that application timings of 15 or more seconds should be avoided. Previous studies reported that kids experienced maximum application timings of 15 and 30 sec.^{7,13} A range between 5 and 7 sec may be appropriate to complete cautery disbudding without inducing thermal injury to the brain, although this should be evaluated in future studies.

Two common cautery techniques involve cauterizing the area around the horn buds and either removing the horn bud or leaving it intact. Removing the horn bud, which takes little effort to flick out, if the skin is completely seared to the bone, is more efficacious in preventing scurs (partial horn regrowth) in goat kids and calves.^{11,21} In kids, leaving the horn bud intact led to a higher percentage of growths termed 'scorns' (neither horns nor scurs), which occurred in approximately 40% of horn buds disbudded in this manner.¹¹ The effect of removing the horn bud on pain and brain injury should be evaluated in future research.

Pain Mitigation Strategies

Pain mitigation strategies available for kids include local or general anesthesia, sedation, or non-steroidal anti-inflammatory drugs. Administration of local anesthesia in the form of a lidocaine block can eliminate the behavioral and physiological responses associated with cautery disbudding that are indicative of pain in calves.²⁰ However, lidocaine administered as a nerve or ring block in goat kids prior to cautery disbudding did not reduce or eliminate pain when compared with kids that were disbudded without lidocaine administration.^{3,4,16} Additionally, a recent study by our group found that a ring block using lidocaine resulted in a similar number of rump movements and tail shakes during disbudding, and similarly elevated cortisol concentrations 15 min post-treatment to kids disbudded without lidocaine (Hempstead et al, unpublished data). The apparent inconsistency of achieving a successful block in goat kids may be associated with the 2 nerves supplying the horn bud (lacrimal and infratrochlear nerves) of goat kids, compared with calves, which have only 1 (lacrimal nerve),^{6,25} meaning that multiple injections per bud are required to achieve a successful block. Together, these results suggest that lidocaine (as it is currently administered) is not useful for reducing or eliminating pain associated with cautery disbudding of goat kids. Future research into dosage, concentration, formulation or the route of administration (e.g., topical, injected) should be investigated.

Inducing general anesthesia using isoflurane reduced post-operative pain associated with cautery disbudding, as evidenced by lower cortisol concentrations and head shakes than cautery disbudded control kids 15 min after treatment.⁹ Sedation using dexmedetomidine reduced the behavioral responses during disbudding, and the cortisol concentrations immediately after were lower than kids that did not receive dexmedetomidine, indicating a lesser experience of pain.¹⁶ These methods may be useful for reducing or eliminating pain associated with disbudding of goat kids, but may be impractical for use on-farm, due to the requirement of veterinary administration, which would increase costs significantly.

Non-steroidal anti-inflammatory drugs such as meloxicam may reduce pain for up to 24 h as evidenced by a lower score on a visual analogue scale (which summarizes a variety of behaviors) than kids disbudded without prior administra-

tion of meloxicam.¹³ Meloxicam may be useful for alleviating post-operative pain associated with inflammation as it is relatively cheap and can be administered by non-veterinary staff (with prescription).

Conclusions

It appears that current cautery disbudding practice varies substantially across operators. To improve consistency and reduce the risk of deleterious consequences associated with cautery disbudding, best-practice recommendations should include proper training specific to goat kids, goat kid age (1 week old), breed and sex, iron power source, temperature and timing (5 to 7 sec), removal of the horn bud, and appropriate pain mitigation (i.e. isoflurane, dexmedetomidine, or meloxicam). Goat kid-focused best-practice recommendations for cautery disbudding can improve goat welfare.

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