

# Current Data on Dehorning Calves

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## Abstract

Dehorning calves is a necessary practice that should be conducted as early as possible and with appropriate anesthetic/analgesia. With the possible exception of caustic paste, calves perceive and react to acute pain during dehorning, regardless of method, when no local anesthetic is used. Extensive research has shown that dehorning stimulates both an acute pain response and a delayed inflammatory reaction. These effects have been measured through physiological, behavioural, and pain sensitivity responses. The best method to fully address pain management for dehorning should include both a local cornual nerve block and systemic analgesia, particularly when calves are dehorned at or beyond four weeks of age. Current adoption rates of farm operator's use of local anesthetics and/or systemic analgesia for dehorning are extremely low. Veterinarians are influential in designing dehorning protocols for on-farm use. A routine dehorning service conducted by trained technicians through a veterinary practice is one means of controlling dehorning protocols on-farm.

## Résumé

L'écornage des veaux est une pratique nécessaire qui devrait être faite le plus tôt possible et avec une anesthésie/analgesie appropriée. À l'exception de la pâte caustique, les veaux perçoivent et réagissent à la douleur aiguë durant l'écornage peu importe la méthode utilisée si une anesthésie locale n'est pas employée. Beaucoup de travaux indiquent que l'écornage engendre à la fois une réaction intense de douleur et une réaction inflammatoire subséquente. Ces effets ont été mesurés par l'intermédiaire des réponses physiologiques, comportementales et de sensibilité à la douleur. Le meilleur moyen de gérer dans son ensemble la douleur reliée à l'écornage devrait inclure une insensibilisation locale du nerf de la corne et une analgesie systémique surtout lorsque des veaux sont écornés après 4 semaines d'âge. À ce jour, l'anesthésie et/ou l'analgesie systémique lors de l'écornage ne sont utilisées que très rarement par les opérateurs à la ferme lors de l'écornage. Les vétérinaires ont une influence dans la planification des protocoles d'écornage à la ferme. Un moyen de contrôler les protocoles d'écornage à la ferme est d'offrir un service d'écornage de routine par l'entremise d'une pratique vétérinaire qui serait mené par des techniciens entraînés.

## Introduction

Dehorning is a necessary task on dairy farms aimed at reducing the risk of injury to handlers and other cattle. Choosing whether or not to dehorn calves, therefore, is not a debate. However, how we dehorn calves is open for criticism and discussion. Genetic control of dehorning through breeding polled cattle is possible but is not a practical solution, at least in the short term. Agricultural practices are coming under increasing scrutiny from the public. Common management practices, such as dehorning, may be negatively perceived and lower the reputation of the industry. Considering this, it is important for all of us within the industry – advisors and farm personnel – to carefully choose a dehorning protocol aimed at minimizing pain.

Several surveys in North America have recently been conducted that are informative with respect to current dehorning practices on dairy farms. In the U.S. it was reported that of 113 dairy farms in the Midwest and New York, 12% used anesthetic and 2% analgesia for dehorning.<sup>3</sup> The most common method used for dehorning was electric or gas hot iron (67% of calves), followed by caustic paste (10%), and gouging (9%).<sup>3</sup> The majority of calves were dehorned prior to 12 weeks of age.

Similar calf dehorning demographic findings were reported in a Canadian survey conducted in the dairy industry in the province of Ontario.<sup>14</sup> That survey indicated the most common age in Ontario for dehorning dairy calves was four to eight weeks of age, and the most common method was using a hot-iron electric (Rhinehart) dehorner. Producers in that province dehorn 78% of dairy calves, with the remainder performed by veterinarians.<sup>14</sup> Survey respondents reported that 23% of producers who dehorned their own calves used lidocaine nerve blocks for reducing acute pain at dehorning. Of the veterinarians surveyed, 92% used local anesthetics for dehorning. Putting these two figures together indicates that only 35 to 40% of dairy calves in Ontario receive the benefit of a local anesthetic at the time of dehorning.

A cross-Canada survey of veterinarians indicates that fewer veterinarians provide analgesia for dehorning beef calves compared to dairy calves.<sup>7</sup> However, the decision by veterinarians to use analgesia for dehorning is more complicated than whether the animal is a beef or a dairy calf. Veterinarians are more likely to use analgesia for dehorning if they perceive dehorning as painful or if they are concerned with personal safety,

while they are less likely to consider analgesia or to consider dehorning painful if they perceive that owners are unwilling to pay for it.<sup>8</sup> The Ontario survey respondents were asked why they used or didn't use local anesthetic. Common reasons for not using it included: cost, time, unaware of it, considered it unnecessary.<sup>14</sup> Producers who administered local anesthetic used lidocaine primarily for pain management, but considered it cheap and enhanced the safety of the procedure for both the handler and the animal.<sup>14</sup>

## Methods of Pain Control

### Age

It is generally accepted that the younger the animal is the less painful the dehorning procedure is. This is most likely a function of dehorning a smaller horn bud and causing less trauma rather than being a function of a physiologic age response. There have been many dehorning experiments conducted on dairy calves of various ages. However, it is extremely difficult to compare age responses because of both the inherent confounding of the calves themselves as well as methodological differences between studies. In experiments conducted at the University of Guelph (data unpublished) using similar methods, younger calves (<4 weeks old) dehorned with a butane dehorner had substantially fewer head shakes, head rubs, and ear flicks (behaviours associated with dehorning pain) in the hours following the procedure, compared with older calves (6-10 weeks old) dehorned with an electric dehorner (Rhinehart). The electric hot iron device leaves a much greater burn diameter than the smaller butane dehorner.

### Method of Dehorning

The older the calf and the larger the horn, the more painful the procedure becomes. Thus, instead of waiting to use gougers, keystones, or wire on larger horns, it is best to do the calves at a younger age. In older calves (5-6 months) a comparison of gougers, keystones or wire revealed no differences in the cortisol responses between these methods.<sup>19</sup> Some studies have suggested that cautery in addition to gouging may help reduce the pain response (ie lower cortisol concentrations).<sup>15, 20</sup> However, use of a hot iron on its own still elicits measurable cortisol and behavioural responses for several hours post-dehorning.<sup>2,5</sup> Even within the options for burning horns, the smaller devices – such as Buddex or Portasol – are probably a better choice and likely inflict less post-surgical pain than the Rhinehart or similar device. Another option for dehorning is caustic paste. Research on caustic paste indicates that a local anesthetic block is unnecessary and the pain response following dehorning is minimal when animals are sedated with xylazine.<sup>21</sup> The main reported problems

with caustic paste are either applying too much which can lead to eye ablation in severe cases, or applying too little which results in regrowth of the horn. However, in a study conducted at a custom heifer rearing facility, we observed no regrowth or eye problems in over 200 calves dehorned with caustic paste (data unpublished). Careful attention was given to a controlled application of the caustic paste in that study.

### Pain of Dehorning

Virtually all research on pain of dehorning and its control has been conducted on dairy heifer or bull calves, with limited or no data on beef calves. Pain elicited from dehorning can be divided into two categories: 1) acute (at the time of dehorning) and 2) inflammatory (pain derived from the dehorning insult on tissues). The acute phase of pain for dehorning is marked by a rapid rise in cortisol concentrations that peak within several minutes and then decline to a plateau above the starting baseline and remain at that level for several hours.<sup>9,20</sup> There is typically a 'rebound' in cortisol in two to four hours coincident with the local anesthetic block wearing off.<sup>9</sup> In calves that are not blocked at dehorning, heart rate remains elevated for nearly four hours.<sup>5</sup> A recent study measured significant responses with an electroencephalograph and increased heart rate in calves dehorned under a light general anesthetic (halothane) but no block when compared to the same anesthesia but with a cornual nerve block.<sup>4</sup> Many people object to using a block, particularly with smaller calves because they say they can't tell if the block worked.

A study was conducted in 27 calves, where nine received lidocaine, and the others received saline.<sup>4</sup> The technician administering the blocks was blinded to the treatments and yet was able to correctly identify all nine calves that were blocked. Further, the behaviour of these calves at the time of dehorning was recorded. The most common behaviour in the non-blocked calves was foot stamping. Calves not receiving a block stamped their feet on average 22 times during butane dehorning compared to an average of four foot stamps in the blocked-calf group.

Other behaviours associated with pain (not being blocked) were vocalization, rearing, kicking, and falling. Not all non-blocked calves vocalized (less than half), but vocalization only occurred in this group. Other studies have demonstrated kicking and struggling at dehorning as evidence of a reduced effective block.<sup>1,16</sup> Important behavioral indicators of pain following dehorning include head shakes, head rubs, ear flicks and tail flicks. Various studies involving the use of non-steroidal anti-inflammatory drugs (NSAIDs) have indicated benefits in the reduction of these behaviors for anywhere from six to as long as 24 hours after dehorning, depending on the therapeutic regimen.<sup>2,10</sup>

### *Administering of Cornual Nerve blocks*

Routinely administering a lidocaine cornual nerve block is not that difficult and becomes part of the dehorning routine once the decision is made to do it. Although some have used ring blocks for blocking horns<sup>2,21</sup> in addition to the cornual nerve block, we find this unnecessary provided the block is performed correctly with adequate volume. Volume of local anesthetic per nerve block has ranged from as little as 3 mL of 2% lignocaine<sup>15</sup> to as much as 6 ml per side of either 2% lignocaine or 0.25% bupivacaine.<sup>16</sup> We use 5 mL of 2% lidocaine on each side injected with an 18-gauge 1½ inch needle. We find that the best injection site is usually 1/3 of the distance from the edge of the eye to the horn, but injected at the approximate level of the eye, below the frontal crest bone (ridge of bone running toward the horn). It is helpful to fan the lidocaine out by slightly angling the injection in different directions. Depositing approximately 1 mL as you withdraw the needle appears to improve success.

### *Use of Non-Steroidal Anti-inflammatory drugs (NSAIDs)*

These drugs include flunixin meglumine, ketoprofen, acetylsalicylic acid, meloxicam and phenylbutazone. However, many of these drugs are not approved for food animal use in all or any North American countries. Several studies have shown that with most dehorning procedures, the cornual nerve block only manages the acute pain. Inflammatory pain is experienced at the time the local anesthetic wears off, regardless of whether the block is extended up to eight hours post dehorning.<sup>9</sup> Thus, there is an important role for NSAIDs and there is a need to encourage regulatory agencies and pharmaceutical companies to consider pain management as a label claim for some of these efficacious products. The purpose of administering these products in calves is to help manage pain following the dehorning procedure. There have been several studies now that have found benefits to the additional use of NSAIDs when administered with lidocaine at the time of the cornual nerve block. In calves aged three to four months dehorned by gouging, a local anesthetic (6 ml per site) and administration of ketoprofen (1.4 mg/lb BW or 3mg/ kg BW) 20 minutes prior to dehorning reduced ear flicking and tail flicking and improved rumination.<sup>11</sup> Calves of the same age dehorned with the same methods also had improved cortisol responses.<sup>10,18</sup>

Faulkner and Weary showed that there were reductions in ear flicks, head shakes and head rubs for calves receiving ketoprofen (3mg/kg BW) and local anesthetic, compared with just a local block in four to eight week old calves dehorned with an electric hot iron device.<sup>2</sup> However, in that study calves were treated with ketoprofen orally at two hours pre-dehorning, and again at two and seven hours post-dehorning. We have found benefits in terms of reduced ear flicks and improved calf starter in-

take when ketoprofen (1.4 mg/lb (3 mg/kg) intramuscular injection) is administered at the time of the cornual nerve block, approximately 10 minutes prior to dehorning in calves six to 10 weeks old dehorned with the Rhinehart electric dehorner. The best way to avoid a reason to use these NSAIDs may be to simply dehorn the calves when they are young. Despite subtle reductions in serum cortisol, there was no additional behavioural benefit (in addition to lidocaine) of using ketoprofen in young calves (< 4 weeks old) dehorned with a butane dehorner.<sup>12</sup> To our knowledge the use of flunixin meglumine has not been investigated for alleviation of pain response from dehorning. Phenylbutazone was found ineffective at altering cortisol patterns in one study.<sup>18</sup> Recently, we have evaluated meloxicam at the time of dehorning (currently unapproved for food animals in the U.S. or Canada).

Use of meloxicam (0.22 mg/lb (0.5 mg/kg) intramuscular injection) at the time of lidocaine nerve block (approximately 10 minutes prior to dehorning) for dehorning calves 10 to 12 weeks of age with an electric hot iron device (rhinehart) caused reductions in ear flicks, head shakes, head rubs, tail flicks, pain sensitivity (measured at four hours post-dehorning with an algometer), and serum cortisol concentrations.<sup>6</sup> Behavioral benefits of meloxicam in this study have been observed for up to 44 hours post-dehorning, indicating that calves feel pain from dehorning for at least this duration. This study and a similar unpublished study with ketoprofen have both shown tendencies for NSAID-treated calves to eat more on the day following dehorning. Faulkner and Weary (2000) reported a tendency for ketoprofen-treated calves to gain more weight during the 24 hours following dehorning.<sup>2</sup>

### *Sedation*

Many people like to use sedation (usually xylazine [Rompun]) for dehorning calves. A recent survey indicated that 44% of veterinarians in Ontario use xylazine for dehorning.<sup>14</sup> Primarily veterinarians indicated that safety, restraint, and pain control were reasons for use. It should be noted that there is little pain control benefit to xylazine. Calves given xylazine and butorphanol without a local anesthetic nerve block and dehorned with electric cautery, had similar cortisol patterns to untreated dehorned calves and elevated heart rates for four hours post-dehorning.<sup>17</sup> If calves aren't blocked, they won't always respond to the dehorning procedure (because of the sedation) but they will still feel it. Thus xylazine without lidocaine is not an acceptable method of pain management for dehorning.

### **Role of the Technician in Dehorning**

There is a tremendous opportunity for technician dehorning combined with improving pain management

of dehorning within the dairy industry. Offering a technician service to clients allows a dehorning protocol to be implemented, ensures regular dehorning at the appropriate age and even provides opportunity for some heifer health monitoring. At the Ontario Veterinary College, we have had a technician organize and conduct dehorning visits on most of our dairies for many years. Recently, we conducted a dehorning trial on a large local dairy that previously was fitting dehorning into their schedule when they could find time. At the end of the study, they wanted us to provide the dehorning service because of the advantages listed above. I know of a very large dairy practice in New Zealand that has recently started a similar service for the same reasons.

Interestingly, analysis of the Ontario dehorning survey data indicated that the use of lidocaine in 100% of the calves for dehorning was over 20 times more likely if the veterinary practice utilized a technician for dehorning dairy calves.<sup>14</sup>

### Recommendations for Dehorning

1. Devise calf dehorning protocols with your clients and teach the technical skills, such as administering a local nerve block.
2. Dehorn calves at a young age (< 4 weeks old)
3. If possible choose either:
  - A. Small dehorner (Portasol or Buddex) + nerve block
  - B. Caustic paste – (no nerve block required)
4. Administer approved NSAIDs for calves dehorned > 4 weeks of age.

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