Effects of local anesthetic or systemic analgesia on pain associated with cautery disbudding in calves: A systematic review and meta-analysis

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Introduction

Disbudding is a common management procedure performed on dairy farms and, when done without pain mitigation, is viewed as a key welfare issue. Use of pain control has increased in recent years, but full adoption of anesthesia and analgesia by veterinarians or dairy producers has not been achieved. Part of the gap between primary research and application in the dairy industry may be driven by the lack of a consistent set of recommendations from primary research papers. Likewise, narrative reviews typically do not include evidence-based methods to identify, assess, and synthesize results; as a result, conclusions may suffer from bias. Conversely, properly conducted systematic reviews offer a more robust and transparent methodology to identify, evaluate, and summarize evidence on a given topic. Meta-analysis also allow for synthesis of overall effects as well as identification and exploration of causes of heterogeneity among studies, possibly identifying sources of variability that may be further examined or used to guide inferences of the robustness of the observed effects across different study designs or settings. The objective of this systematic review was to examine the effects of these pain control practices for the most common method of disbudding (cautery) on outcomes associated with disbudding pain in calves.

Materials and Methods

Intervention studies describing cautery disbudding in calves 12 weeks of age or younger were eligible, provided they compared local anesthesia, nonsteroidal anti-inflammatory drug (NSAID), or local anesthesia and NSAID to 1 or more of local anesthesia, NSAID, or no pain control. The outcomes considered were plasma cortisol concentrations, pressure sensitivity of the horn bud area, and validated pain behaviors (ear flick, head shake, head rub, foot stamp, and vocalization). Our search strategy used the Agricola, Medline (via OvidSP), and Web of Science databases, as well as the Searchable Proceedings of Animal Conferences (S-PAC), ProQuest Dissertations and Theses Database, and Open Access Theses and Dissertations. Meta-analysis was performed for all outcomes measured at similar time points with more than 2 studies.

Results

Of the 4,394 records identified, 21 articles comprising 23 studies were eligible for qualitative synthesis. Local anesthetic was associated with reduced plasma cortisol until 2 h post-disbudding (30 min, n=7 studies; 1 h, n=8; 2 h, n=5); however, a rise in cortisol was observed in the meta-analysis of studies reporting at 4 h post-disbudding (n=5). Heterogeneity was present in several of the analyses for this comparison. The addition of NSAID to local anesthetic showed reduction in plasma cortisol at 4 h (n=6), and a reduction in pressure sensitivity and pain behaviors in some analyses between 3 and 6 h post-disbudding (n=3 to 6). Heterogeneity was present in some meta-analyses, including several using pain behavior outcomes.

Significance

Heterogeneity in meta-analyses of studies examining the effects of NSAID treatment may reflect the variation in measurement time periods for behavioral measures between studies, as well as differences among treatments. Overall, a protective effect of local anesthetic was seen for the acute pain of cautery disbudding, and the delayed rise in cortisol was mitigated by the addition of an NSAID, which also reduced other signs of pain, including pressure sensitivity and pain behaviors. Based on these findings, we recommend use of local anesthetic and an NSAID as best practices for pain mitigation for cautery disbudding of calves 12 weeks of age or less. The magnitude and duration of the effect of NSAID treatment was not possible to deduce from the literature because wide variation existed between studies. We recommend adherence to reporting guidelines and consideration of more standardized outcome measurements, particularly for pain behaviors.