

Effects of multimodal pain management strategies on acute pain behavior and physiology in disbudded neonatal goat kids

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Introduction

Disbudding of goat kids is a common husbandry procedure in the dairy goat industry, typically carried out in the first week of life via a hot cautery iron without the application of pain relief. The objective of this study was to identify a practical, efficacious pain management strategy for disbudding by monitoring acute changes in behavior and plasma biomarkers in goat kids disbudded with varying combinations of pain relief.

Materials and Methods

This randomized clinical trial was conducted at the University of Minnesota in March 2019. Forty-two male and female Toggenburg, Alpine, and Saanen kids ranging in age from 1 to 13 d were obtained from a local goat dairy. At arrival, kids were allocated into 1 of the following 7 treatment groups (n=6/group) according to a randomized block design: Sham Disbudding (SD); 0.05 mg/kg IM xylazine (X); 2.8 to 5 mg/kg SQ buffered lidocaine (L); 1 mg/kg PO meloxicam (M); IM xylazine + buffered lidocaine (XL); IM xylazine + PO meloxicam (XM); and IM xylazine + SQ buffered lidocaine + PO meloxicam (XLM). Kids were socially housed in groups of 7 (1 kid per treatment group per pen), and fed a minimum of 20% body weight of pasteurized goat milk split into 3 feedings per day. After a 3-day acclimation period kids underwent thermal disbudding by the same trained individual who was blinded to treatment. Kids were brought to a room adjacent to their home pen and received treatments 20 min prior to the disbudding procedure. SD kids received the same handling, with the exception of the disbudding iron being cold. Kids were monitored for 2 hours post disbudding, at which point they were returned to their home pen. Jugular venous blood samples (3 mL) were obtained before (-20, -10, and -1 min) and after (1, 15, 30 min and 1, 2, 4, 6, 12, 24, 36, and 48 h) disbudding for measurement of plasma cortisol and prostaglandin E2 (PGE2). Pain sensitivity was measured via pressure algometry with a digital vonFrey anesthesiometer at -20 min and at 4, 12, 24, and 48 h post-disbudding. A single trained individual blinded to treatment observed each kid during disbudding and recorded frequency of vocalizations and struggles. Video cameras were mounted in each pen to

continuously record behaviors from -24 h before disbudding until 48 h after disbudding. Daily body weights (kg) were obtained prior to the morning milk feeding. The effect of treatment on plasma cortisol (mmol/L) and PGE2 (pg/ml), mechanical nociception threshold (MNT; kgf), body weight (kg), and vocalizations during disbudding were compared using mixed linear regression models accounting for the effect of kid breed, sex, and pen, for repeated measures where appropriate, and adjusting for multiple comparisons. Significance for all models was determined at $p < 0.05$; trends at $p < 0.10$. Data are shown as Means \pm SEM.

Results

Breed and sex were equally distributed by treatment group, with no difference in kid age or baseline body weight between groups. Duration of disbudding did not vary among treatments (63 ± 17 s). Treatment affected MNT ($p = 0.0378$) such that M kids were more sensitive overall than SD kids (0.93 ± 0.11 kgf vs 1.35 ± 0.12 kgf; $p = 0.01$). Likewise, vocalization frequency was affected by treatment ($p = 0.0005$) after controlling for the effect of duration of the disbudding procedure. Vocalizations during disbudding were significantly lower in treatment groups XLM (13 ± 2 ; $p = 0.0001$), XM (19 ± 2 ; $p = 0.0299$), and XL (18 ± 2 ; $p = 0.0184$) than in treatment M (28 ± 2), and in treatment XLM (13 ± 2) than in treatment L (23 ± 2 ; $p = 0.0188$). Vocalizations were not different between treatments M and L. Number of struggles during disbudding (7 ± 1) and 48-hour post-disbudding weight gain (0.068 ± 0.009 lb/d; 0.14 ± 0.02 kg/d) were not affected by treatment.

Significance

Preliminary results of this study suggests that multimodal pain management approaches may attenuate pain responses during disbudding in goat kids. Further analysis will elucidate treatment effects on behavior and plasma biomarkers in the 48 h following disbudding.