Effect of Oral Flunixin Meglumine on Heart Rate, Physical Activity, and Salivary Cortisol Concentration following Cautery Disbudding of Dairy Calves

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Introduction

US dairy calves are often disbudded at an early age without analgesics, whereas several other countries require analgesics. Administration of nonsteroidal anti-inflammatory drugs (NSAIDs) in milk replacer would be a simple, stress-free method to deliver analgesics for disbudding if shown to improve well-being. Most studies of NSAID efficacy involve older animals, NSAIDs not labeled for use in US cattle, or NSAIDs administered by injection. Our objective was to determine the effects of administering an NSAID labeled for use in US cattle (flunixin meglumine; FM) in milk replacer on heart rate (HR), physical activity (PA), and salivary cortisol concentration (SCC) in young dairy calves disbudded by cautery.

Materials and Methods

Two groups of Holstein-Friesian calves between 6 and 11 d of age were enrolled. Group 1 consisted of 32 calves, with 16 administered FM and 16 a placebo. Group 2 consisted of 14 calves, with 7 administered FM and 7 a placebo. Calves in Group 2 but not Group 1 were sham disbudded 24 h before actual disbudding. Calves were randomly assigned to treatment groups, housed individually, and fitted with self-contained, battery-operated, continuous-logging HR and movement sensor monitors (Actiheart®). Mean HR and PA were recorded for each min, with activity being detected by accelerometry. A 24 h acclimation period was provided before disbudding calves with a butane dehorner (Portasol®). Milk replacer was fed every 12 h. FM-treated calves were administered 100 mg of FM in milk replacer at the evening (-16 h) and morning (-4 h) feedings before disbudding. Placebo-treated calves received an equivalent volume (2 mL) of 0.9% saline. Saliva was collected at -60, -30, -5, 30, 60, 90, 120, 180, 210, and 240 min relative to disbudding, and free SCC was measured by ELISA. HR and PA recording continued for 22 (Group 1) or 7.5 (Group 2) h after disbudding. Actiheart® data were downloaded and epochs with HR < 60 beats per minute (bpm) or > 180 bpm, considered to reflect noise from muscle movement, were discarded. Data were expressed as least squares means ± standard error of the means (SEM) or geometric mean and 95% confidence interval (CI) and were analyzed using PROC MIXED with repeated measures; $P < 0.05$ was considered significant.

Results

Significant time effects were observed for HR, SCC, and PA in both studies, with disbudding temporally related to mild, transient increases in HR and SCC and reduction in PA. HR in FM-treated calves in Group 1 (96.2 ± 0.9 bpm) averaged 6.4 bpm lower than in placebo-treated calves (102.6 ± 0.8 bpm; $P < 0.0001$). A smaller difference of 3.2 bpm between FM-treated (101.7 ± 1.6 bpm) and placebo-treated (104.9 ± 1.6 bpm) calves in group 2 was not significant ($P = 0.19$). The lower HR in FM-treated calves in Group 1 was accompanied by higher PA (1.66; 95% CI, 1.58 to 1.76 units) and lower SCC (3.9 ± 2.0 ng/mL) compared with placebo-treated calves (1.49; 95% CI, 1.42 to 1.57 units [$P = 0.0075$] and 4.3 ± 2.2 ng/mL [$P = 0.049$], respectively), but there were no significant treatment x time interactions. No effect of FM on mean PA ($P = 0.99$) or SCC ($P = 0.18$) was observed in Group 2. The effect of sham disbudding on HR, PA, and SCC was reported elsewhere.

Significance

Findings suggested that cautery disbudding of 6 to 11 d old dairy calves is associated with mild transient alterations in HR, SCC, and PA. Findings of study 1 suggested that pre-treating calves orally with FM 4 and 16 h before disbudding may lower HR and SCC and increase PA in the perioperative period. HR findings in study 2 supported those of study 1, but study 2 lacked sufficient power to detect meaningful differences. The biological relevance of the small effects of FM on HR, SCC, and PA in study 1 is uncertain. Furthermore, because patterns of HR, SCC, and PA responses were similar for FM-treated and placebo-treated calves, the differences in mean values appeared to be unrelated to disbudding and possibly due to effects on subclinical enteric infection. We cannot conclude from this study that cautery disbudding causes substantial discomfort in 6 to 11 d old dairy calves or that oral administration of FM reduces discomfort.