Animal Behavior and Well-Being Platform Session: Assessment of Affective States of Dairy Cattle


How animals feel is both at the center of concerns about animal welfare and one of the most challenging questions for which to make strong scientific inferences. In this presentation, I will review various approaches used to investigate affective experiences in cattle, with a special focus on pain and fear (as much of the research is in this area). I will describe various methods available and argue that some of the most commonly used approaches suffer from important weaknesses. For example, provoked acute responses can be both highly variable and non-specific, meaning that both responses and non-responses are difficult to interpret. Stronger inferences can be drawn in cases where the functions of the responses are well understood, and with addition of appropriate control groups using drug treatments to target specific affective mechanism (e.g., analgesics in the case of pain). I will also review more elaborate approaches, including the use of approach-avoidance testing (that allows inferences about how much the affect matters to the animal), conditioned-place avoidance (that rely upon the memory of an experience), and drug-naming trials (that allow more specific inferences about affective states). Finally, I will discuss the potential of approaches that explore the longer-term impact of affective experiences, such as a cognitive bias testing and anhedonia responses that may indicate mood changes and suggest more important welfare consequences.

Key Words: affect, animal welfare, enrichment

38 Effects of local anesthetic and/or systemic analgesia on pain associated with cauter y disbudding in calves: A systematic review and meta-analyses. C. B. Winder*1, C. L. Miltenburg1, J. M. Sargeant2, S. J. LeBlanc3, D. B. Haley1, K. D. Lissemere1, M. A. Godkin3, and T. F. Duffield1, 1Department of Population Medicine, University of Guelph, Guelph, ON, Canada, 2Centre for Public Health and Zoonoses, University of Guelph, Guelph, ON, Canada, 3Ontario Ministry of Agriculture, Food, and Rural Affairs, Elora, ON, Canada.

Disbudding is a common management procedure performed on dairy farms, and when done without pain mitigation is viewed as a key welfare issue. Although use of pain control is increasing, full adoption of anesthesia and analgesia has not been achieved. The objective of this systematic review was to examine the effects of pain control practices for cautery disbudding on outcomes associated with pain, specifically: plasma cortisol concentration, pressure sensitivity of the horn bud, and validated pain behaviors. Intervention studies describing cautery disbudding in calves 12 wk of age or less were eligible, provided they compared local anesthesia, non-steroidal anti-inflammatory drug (NSAID), or both, to one or more of local anesthesia, NSAID, or no pain control. Of the 4,394 records identified, 21 articles comprising 23 studies were eligible for qualitative synthesis. Meta-analysis was performed for all outcomes measured at similar time points with more than 2 comparator groups. Local anesthet ic 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). 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 several meta-analyses, including many examining pain behavior. This may reflect variation in measurement periods, and/or differences among NSAID treatments. Overall, a protective effect of local anesthetic was seen for acute pain, and the delayed rise in cortisol was mitigated by use of an NSAID, which also reduced pressure sensitivity and pain behaviors. These findings support the use of local anesthesia and an NSAID, but the magnitude and duration of the effect of NSAID treatment was not possible to deduce from the literature due to the variation between studies. We recommend adherence to reporting guidelines and consideration of more standardized outcome measurements, particularly for pain behaviors.

Key Words: pain, disbudding, systematic review
Calves that survive dystocia are often affected by injury, stress, pain, inflammation, hypoxia, acidosis and low overall vitality. Yet, vigor scoring systems, like the Apgar score used with human infants, have not been developed and validated. It was the objective of this research to quantify the effects of dystocia, to relate these effects to measurable signs of reduced vigor, and to develop a scoring system from these data. It was hypothesized that the proposed scoring system would be well-correlated with the physiological status of the calf, as well as future health and growth. Data from a comprehensive literature review and 3 separate investigations were used to develop the scoring system. Data were managed in Microsoft Excel and exported into Stata/IC 10 for variable screening and statistical modeling. Univariable or multivariable linear regression models were constructed to determine associations between specific physiological or clinical outcomes of interest. From these basic observations, a newborn calf VIGOR assessment tool was developed that could be quickly and easily performed by dairy producers. The final tool included 10 separate measures, under 5 categories. Visual appearance included measures of meconium staining and tongue/head swelling. Initiation of movement focused on time to sternal recumbency and standing. General responsiveness was assessed through 4 measures, including sucking reflex, the straw tickle test, tongue pinch, and eye reflex. Oxygenation was classified by mucous membrane color. Finally, the rates of heart beats and respirations per minute were scored in 3 broad categories. Using these measures, calving assistance was highly associated with decreasing newborn calf vitality. However, increased time between birth and VIGOR assessment significantly improved the score, due to a longer recovery interval following birth. Associations of meconium staining and eye reflex with assistance at calving were not consistent and should be re-evaluated. In conclusion, the proposed VIGOR Scoring System is ready for dissemination and large-scale assessment, as well as the development of an iPad app for convenient data collection, storage and analysis.

Key Words: newborn, calf, vigor

Calves experiencing dystocia frequently suffer from tissue injury and associated inflammation and pain. The study objective was to conduct a randomized controlled field trial to evaluate the effect of implementing a novel program that includes initial assessment of newborns using the VIGOR Scoring System (U of Guelph) followed by provision of a non-steroidal anti-inflammatory (NSAID) to calves with low vigor scores, on outcomes reflecting calf well-being and health. The study was conducted in the summer of 2017 on a 5,000-cow dairy in MN. Live born calves underwent enrollment within 3 h of birth (T0), including recording of weight and rectal temperature, collection of a venous blood sample, vitality assessment using the VIGOR System and colostrum feeding. The calf was then randomly assigned to either the treatment (TX) or control program (CON). Within the TX program, calves with a low VIGOR score (<21) were administered a gel capsule per os containing meloxicam (approximately 1 mg/kg). Between 24 and 36 h post-enrollment (T24) calves were reassessed using the VIGOR system, temperature recorded and a second blood sample collected. Paired (T0 and T24) plasma samples from 300 randomly selected calves were submitted for determination of plasma prostaglandin E2 (PGE2, pg/mL) and cortisol (ng/mL) concentrations. Of 1,483 calves enrolled (CON = 760; TX = 723), 68% and 32%, respectively, achieved a high (>21) or low (<21) VIGOR score at T0. Multivariable linear regression models showed that at T0, calves with low VIGOR scores were heavier, were from calves with higher dystocia scores (DS; 0 to 5) and had increased plasma PGE2 concentrations (BWt = 40.2 kg; DS = 0.50; log10PGE2 = 1.63) as compared with calves with high VIGOR scores (BWt = 39.4 kg; DS = 0.37; log10PGE2 = 1.53) (P < 0.05). Meloxicam treatment of low VIGOR calves at T0 resulted in a larger reduction and lower plasma PGE2 concentrations by T24 (log10PGE2 = 0.76), as compared with untreated low VIGOR calves (log10PGE2 = 0.99). We conclude that newborn calves with a low VIGOR score experienced increased inflammation as compared with calves with a high VIGOR score, and that meloxicam treatment of low VIGOR calves significantly alleviated inflammation by 24 h of age.

Key Words: newborn, calf, vigor

Can calving assistance influence dairy cows’ lying times?

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Assistance is often provided to cows and heifers during calving by dairy producers and veterinarians to minimize morbidity and mortality. Even though calving is believed to be painful for both cows and calves, especially when strong assistance is provided, the animals’ discomfort is difficult to measure. Many research studies have used lying behavior as a non-invasive indicator of discomfort and pain in dairy cattle. The aim of our study was to evaluate the impacts of various characteristics of calving events on the lying behavior of dairy cows. The lying time of 153 Holstein cows was measured continuously for 10 d after calving using accelerometers, as part of randomized controlled trial on the timing of calving assistance. Of the 153 cows, 74 calved unassisted and 79 received assistance during calving. Among the 79 assisted cows, 56 received early assistance, defined as pulling the calf approximately 15 min after first appearance of both hooves, and 23 cows received late assistance, defined as pulling the calf approximately 60 min after first appearance of both hooves. For 57 of the assisted cows, information on the duration of the pull and the average force applied during the assistance was recorded using an electronic load cell. Univariable and multivariable mixed models that included a random intercept for animal and random slope for days after calving were used to assess the associations between lying time and calving event characteristics. Cows that were assisted during calving had significantly shorter daily lying times compared with cows that calved unassisted (P = 0.002). Among the 79 assisted cows, the timing of the assistance (early versus late) did not significantly influence the daily lying time (P > 0.05). Moreover, the length and force of assistance was not associated with the cows’ daily lying time post calving (P > 0.05). It appears that regardless of the timing, duration, and strength of pulling (within the ranges observed in this study), calving assistance may have reduced the discomfort of the dairy cows.

Key Words: calving assistance, lying time, force of pulling
Mitigation of pain for surgical procedures has become a topic of concern for the public, producers, and veterinarians. The objective of this study was to determine the efficacy of meloxicam for mitigation of pain in adult lactating dairy cattle following a right side laparotomy with omentopexy. Twenty-four dairy cattle >20 mo old and between 50 and 188 d in milk (mean 121 d) were enrolled. Cattle were acclimated for 7 d, assigned to blocks based on days in milk, milk yield, and pregnancy status, and randomly assigned to groups (MEL or CON). The study had 2 phases; sham (d 0–14) and surgery (d 15–28). On d 0, a sham procedure was performed on all animals. Cattle were prepared for surgery including local blocks with lidocaine. Injectable meloxicam (MEL) or saline placebo (CON) was administered (dose: 0.5 mg/kg) 5 min before simulated surgery (restraint for 30 min). On d 15, a right flank laparotomy, brief abdominal exploration, and omentopexy was performed on all animals.

Haptoglobin was significantly increased in the CON 72 h post-surgery (CON mean 476.6 ± 110.7 µg/mL; MEL mean 202.5 ± 92.1 µg/mL; P = 0.01). Cortisol was significantly increased in the CON 4 h post-surgery (CON mean 22.7 ± 4.9 ng/mL; MEL mean 9.5 ± 2.0 ng/mL; P = 0.009). There was no difference for fibrinogen (P = 0.08), PGE2 (P = 0.1), MNT (P = 0.14) or IRT (P = 0.68).

The results demonstrate that meloxicam significantly reduced some indirect measures of pain and suggests meloxicam is effective in mitigating post-operative pain in adult lactating dairy cattle.

Key Words: pain, meloxicam, cortisol