

Quantifying the relationship between calving ease and physiological indicators of trauma in beef calves

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Introduction

Calf survival is crucial to successful cow-calf operations. One major factor that impacts calf health and survival is the amount of difficulty experienced during the birthing process. Assisted calves are often born weak, which can interfere with normal neonatal behaviors such as ingesting colostrum, leading to failed transfer of passive immunity and increased morbidity and mortality before weaning. Few studies have quantified physiological indicators of trauma in calves assisted at birth, nor have the effects of trauma on passive immunity been thoroughly assessed. The objective of this study is to quantify the associations of calving ease, calf vigour, and birth L-lactate, with trauma biomarkers and passive immunity in newborn beef calves.

Materials and Methods

Data were collected in March 2014 from 77 cow-calf pairs that were enrolled on a privately-owned cow-calf operation consisting of 800 Hereford and Hereford x Red Angus dams. Pregnant animals were monitored on pasture close to the calving barn and checked hourly for signs of calving. Dams that did not require assistance were allowed to calve in the pasture (n = 22). Dams failing to calve or make progression within one hour of estimated onset of stage two labour were moved into the calving barn for vaginal examination and delivery of the calf (n = 55). Calving ease was classified as unassisted, easy assist (1-2 people manually extracting the calf), or difficult assist (3 people manually extracting the calf or using a fetal extractor).

All at-birth data collected included: date of calving, time of birth, calving ease, presentation and posture of the calf, dam age, calf sex, and calf birth weight. Blood sampling and vigour assessment of calves occurred at 10 min and 24 h of age. Calf vigour was assessed by evaluating: mucous membrane colour (pink or abnormal), tongue withdrawal (complete or incomplete), and suckling reflex (strong or weak). Blood biomarkers measured were creatine kinase (CK), aspartate aminotransferase (AST), haptoglobin, and L-

lactate. Serum immunoglobulin concentration was measured and optimal passive immunity (OPI) was considered >24 g/L.

Data was analysed using STATA® 14.1 software (Stata-Corp LP, College Station, TX) to investigate the relationship of at-birth parameters with 24 h post-birth biomarkers and passive immunity. Descriptive statistics and tests for normality were performed on all continuous variables. A one-way ANOVA or Student's T test were performed on normally distributed variables, and a Kruskal Wallis test or Wilcoxon Rank Sum test were performed on non-normally distributed variables.

Results

Abnormal calving ease (easy and difficult assists) was associated with higher CK (P=0.002), AST (P=0.01), 24-hour blood L-lactate (P=0.05) concentrations, and decreased chance of OPI (P=0.004). Abnormal mucous membrane color, tongue withdrawal, and suckle reflex at birth were associated with elevated levels of CK (P<0.001) and AST (P<0.001), and decreased chance of OPI (P<0.05). Abnormal tongue withdrawal was also associated with elevated 24-hour blood L-lactate concentration (P=0.0006). Birth blood L-lactate concentration was associated with elevated levels of CK (P=0.002) and AST (P=0.004), and decreased chance of OPI (P=0.002). Haptoglobin was not significantly different between any of the at-birth parameters measured.

Significance

Calving difficulty and birth blood L-lactate concentrations were associated with elevations in the physiological biomarkers, indicating tissue trauma. Calving difficulty was also associated with indicators of poor calf vigour and decreased chance of optimal passive immunity. Poor vigour was associated with tissue trauma biomarkers and failed transfer of optimal passive immunity. Understanding the impacts of a traumatic birth may aid the development of pain mitigation strategies for newborn calves to decrease the impacts of dystocia on calf health.