Results

Evaluation of behavioral data revealed an increase in the steps taken as parturition approached, starting approximately within 2 to 4 hours prior to calving. Lying bouts became more frequent and shorter in duration as parturition approached, and demonstrated the most striking deviation from baseline in all recorded behavioral indices. Immediately following calving, time spent standing increased and lying bout frequency decreased.

Significance

Changes in behavioral indices during the periparturient period were demonstrable in beef cattle using accelerometers. The potential exists for algorithm development to better predict impending parturition as well as development of commercially available activity monitors in pastured beef cattle.

Evaluation of digital Brix refractometry in assessing maternal colostrum quality and transfer of passive immunity in beef cattle

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Introduction

Newborn calves depend on passive immunity acquired by the timely ingestion of colostrum containing adequate concentrations of immunoglobulin G (IgG). Failed transfer of passive immunity (FTP) in calves is defined as serum IgG concentrations <10 g/L, measured between 1 and 7 days after birth. It is estimated that up to 27% of beef calves suffer from FTP, which can affect calf health, survival, and growth. In contrast to dairy calves that are typically hand-fed prescribed volumes of colostrum, beef calves ideally suck from their dam and do not need human intervention. This requires the calf to be vigorous, the cow to allow the calf to suckle, and the colostrum to be of sufficient quality and quantity. However, beef producers rarely know the quality or quantity of colostrum available to, or consumed by, the calves in their care. Although measuring the volume of colostrum is not generally feasible for beef producers, there are on-farm tools available to estimate IgG concentration. Optical and digital refractometers are widely used to evaluate colostrum and serum of dairy cattle. However, there is minimal published research evaluating these tools in beef cattle. Objectives of this study were to evaluate the effectiveness of the Brix refractometer for estimating quality of maternal colostrum and levels of passive immunity acquired by commercial beef calves.

Materials and Methods

During the 2013 to 2015 calving seasons, 148 cow-calf pairs from 2 large, commercial cow-calf operations in Alberta, Canada were enrolled. Maternal colostrum was collected shortly after calving and, when feasible, calf serum samples were collected 24 hours post-calving. A digital Brix refractometer (PAL-1, Atago Co. Ltd; WA USA) was used for colostrum and serum analysis. Thawed, chilled colostrum and serum were analyzed using radial immune diffusion (RID) to determine IgG concentrations. Descriptive statistical analysis was performed in SPSS 22 (IBM, Armonk, New York, USA). Scatter and Bland-Altman plots were used to evaluate agreement between 2 continuous outcomes. To determine the optimal percent Brix cut-point to identify colostrum below 100, 125, and 150 g/L, the accuracy, sensitivity, specificity, negative and positive predictive values, and kappa were calculated using percent Brix cut-points between 20 and 35%. A similar approach was used to evaluate serum percent Brix, testing cut-points between 7.6 and 8.6% to detect calves with serum IgG below10 g/L.

Results

Less than 3% (n=4) of colostrum samples had IgG concentrations below 100 g/L, while 9% (n=13), 22% (n=33), and 43% (n=63) were between 100 and 125 g/L, 126 and 150 g/L, and over 150 g/L, respectively. To identify colostrum with IgG concentrations of <100 and <125 g/L, a Brix cut-point of 26% resulted in the highest combined sensitivity (Se) and specificity (Sp) (Se=100%, Sp=86%, and Se=88%, Sp=95%, respectively). To identify colostrum with IgG concentration of <150 g/L, a Brix cut-point of 30% resulted in the highest combined Se (88%) and Sp (95%). The overall highest kappa for colostrum was achieved using a Brix cut-point of 26% and RID IgG cut-point of 125 g/L. Only 1.4% of calves (n=2) had serum IgG concentrations below 10 g/L. The optimal cut-point for serum IgG was 7.8%, but this must be interpreted with caution due to low numbers of calves with failed transfer of passive immunity.

Significance

This work provides guidelines for using the Brix refractometer to evaluate colostrum quality on-farm when intervening to ensure adequate transfer of passive immunity in commercial beef calves. However, insufficient numbers of calves with failed transfer of passive immunity were present in this population to assess the ability of the Brix refractometer to detect calves with inadequate levels of serum IgG.

An assessment of two measuring devices for estimation of body weight in newborn beef and dairy calves

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Introduction

Calf birth weight is an important factor that can impact cow and calf health as well as performance on beef, dairy, and veal operations. Methods of estimating weight on-farm without the use of a scale have been developed, the most common of which are measuring tapes that determine the circumference around either the fetlock or girth of a calf. Despite the potential utility of these devices, there is a paucity of peer-reviewed research that evaluates their accuracy. Furthermore, many of the previous studies have not used appropriate statistical methodology to assess the agreement between 2 continuous measures. The objective of this study was to evaluate the agreement of commonly-used measuring devices with actual body weight of neonatal beef and dairy calves.

Materials and Methods

A convenience sample of 578 calves were enrolled from the University of Saskatchewan Goodale Farm, 3 commercial beef cow-calf operations, the University of Guelph's Elora Dairy Research Station, and a commercial veal operation. Beef calves were either Hereford or Hereford-crosses, purebred Red Angus, or Speckled Park, and were weighed at 1 d of age. Dairy heifer calves were all Holsteins and were weighed at 1 to 3 d of age. Dairy bull calves were also Holstein and weighed at approximately 4 to 10 d of age; however, the majority were purchased from an auction market so exact birth dates were unavailable. Calf weight was first estimated using 1 or more of following: a Calfscale® Birthweight Tape (Calfscale Company, Ames, IA), a Beef Stock Weight Tape (The Coburn Company, Whitewater, WI), or a Dairy Calf Tape (The Coburn Company, Whitewater, WI). The Calfscale® Tape (FT) was placed around the fetlock, just proximal to the coronary band of a forelimb, and the corresponding weight was recorded from the appropriate side of the tape, depending if the calf was a bull or heifer. The Beef Stock or Dairy Calf Tape (GT) was pulled snuggly around the girth area of the thorax, just caudal to the forelimbs. Calves were then weighed using a digital livestock scale (DS), which was considered the gold standard. Bland-Altman plots were performed to assess measure agreement in body weight between devices. In addition, the proportional bias and variation around the line of best agreement were studied. Calves were categorized as heavy or light based on the top 25th and bottom 25th percentiles, respectively. All others were categorized as moderate. Weighted Kappa for agreement between gold standard (DS)