Performance of calves fed fresh colostrum from their dams, compared with that of calves fed colostrum from cows other than their dams

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Introduction

Adequate colostrum feeding is the most important management factor determining calf health and survival. Colostrum not only provides immunoglobulins, but it is also an important source of nutrients and nonspecific immune factors, including maternal leukocytes and cytokine proteins, all of which protect the newborn calf against infectious diseases early in life. Considering the potential role of these non-immunoglobulin factors, our hypothesis was that dairy calves fed fresh colostrum from their dams would perform better than those fed colostrum from cows other than their dams that had been stored cold and had a preservative added. The objective was to assess performance (growth and survival) of calves fed fresh colostrum from their dams, compared with that of calves fed colostrum from cows other than their dams that had been treated with a potassium sorbate preservative and stored refrigerated (up to 48 hours) or frozen.

Materials and Methods

This prospective study was undertaken at a large north-central Florida dairy farm with excellent health records and calf management. All calves born between July 1 and July 31, 2010 were eligible for the study. Calves were excluded from the study if they were born subsequent to a dystocia, had physical deformities, were twins, or had a birth weight < 70 lb (32 kg) or > 100 lb (45 kg). Within 20 minutes of calving, colostrum was collected from cows in a routine manner. Twenty minutes after colostrum collection, a colostrometer was used on an aliquot of colostrum to determine colostrum quality. An adjusted colostrum score (ACS) was calculated by means of a correction factor that was used to adjust for temperature. All calves were fed 3.8 L of colostrum via esophageal feeder after the dam's colostrum quality had been determined. Colostrum treatments were assigned by colostrum quality of the dam and gender of the calf as follows: 1) dam ACS >100 mg/mL: heifer calf receives fresh colostrum from the dam, bull calf receives 70 to 90 mg/mL colostrum; 2) dam ACS = 70 to 90 mg/mL: heifer calf receives stored > 100 mg/mL colostrum, bull calf receives fresh colostrum from the dam; 3) dam ACS < 70 mg/mL: heifer calf receives stored > 100 mg/mL colostrum, bull calf receives stored 70 to 90 mg/mL colostrum. If the dam's ACS was not appropriate for the calf that was just born, stored (refrigerated/frozen) colostrum was placed in warm (120°F; 49°C) water for 15 minutes to bring the colostrum temperature up to 90°F (32°C) prior to feeding it to the calf. Calves were weighed at birth and eight weeks of age. Health events were collected by calf barn personnel and recorded in an on-farm computerized record system. From each calf, a blood sample was collected between 48 hours and five days of age for determination of serum total protein (STP) concentration.

Quantitative variables were categorized by quartiles. Main outcome variables were STP concentration, average daily weight gain (ADG), and death. Data were analyzed by logistic regression (SAS, 9.3) by use of generalized estimating equations for categorical responses. Gender was forced into multivariable models; other covariates were considered when $P \leq 0.10$ on univariable analysis. Only covariates with $P \leq 0.05$ were retained in the final multivariable logistic regression model.

Results

A total of 489 calves (heifers, n = 240; bulls, 249) were included in the study. Mortality from birth to 60 days of age was 5.7% and 14.7 % for heifers and bulls, respectively, with respiratory disease being the main cause of death. Average daily gain from birth to weaning was 1.25 lb (0.57 kg)/d and 1.10 lb (0.50 kg)/d for heifers and bulls, respectively. Colostrum source was not associated with calf mortality; survival was only affected by gender ($P = 0.001$). Colostrum was also not associated with ADG. Factors significantly associated with ADG included gender ($P < 0.001$), birth weight ($P < 0.001$), and time to colostrum feeding ($P = 0.01$).

Source of colostrum was significantly associated with STP concentration ($P = 0.0015$). The odds of a high STP concentration (> 6.0 g/dL) for calves given maternal colostrum were 3.33 (95% CI, 1.12 to 9.71) and 2.43 (95% CI, 1.38 to 4.27) times the odds of high a STP concentration for calves receiving frozen or refrig-

erated colostrum, respectively. A high concentration of STP was also associated with high quality of colostrum (>100 mg/mL; $P < 0.01$) and a short time to colostrum feeding (< 30 min after birth; $P = 0.01$). Interactions were not significant.

Significance

Improvements in colostrum feeding may have a significant impact on calf survival and performance. Differences in colostrum management may affect not only immunoglobulins, but also other components that have not been studied in depth. Our main finding was the association between feeding maternal colostrum and higher concentrations of STP in calves. It was concluded that colostrum origin (maternal vs stored) had a significant effect on STP concentration and this association should be further researched.