Feedstuffs, November 5th, 2018 Feedstuffs Reprint

Maternal colostrum versus replacer evaluated in study of Jersey calves

WHILE it is typically thought that providing about three to four quarts of high-quality colostrum within no more than four hours after birth is necessary for good antibody protection for the calf, what happens when that colostrum is not available?

Because of difficulties in getting colostrum properly fed on night or weekend shifts, I know of some large dairies that have employees instead use a colostrum replacer during that time period. I noticed that one large grazing dairy with seasonal calving used only a colostrum replacer due to logistical issues of getting cows milked for colostrum, and calves were fed clean colostrum either before or after they were moved into the calf area. With this approach, calf health problems virtually vanished.

One of the difficulties with doing any calf studies is having enough animal numbers to be able to detect statistically significant differences due to high variability (Kertz and Chester-Jones, 2004).

In that respect, a large-scale study was done with about 1,200 Jersey calves (Lago et al., 2018). A large California dairy farm with Jersey, Holstein and crossbred cows was used for this trial, but only Jersey and Jersey x Holstein crossbred cows and their calves were selected for the study. The study was conducted from July to August 2014. Calves were separated from their dams no later than 10 minutes after calving and were kept in a group until transported to where they were housed in California-style wooden hutches.

Calves then were fed either three quarts of colostrum (609 calves) or 500 g of a colostrum replacer (606 calves) containing 150 g of colostrum-derived immunoglobulin G (IgG) mixed into two quarts of water. All were fed via an esophageal feeder at one hour plus or minus five minutes of birth. These feedings and other measurements were done by research technicians.

Maternal colostrum was harvested twice daily from individual cows, pooled and then poured into three-quart bottles by farm personnel. Within an hour after collection, colostrum was refrigerated until removed by research technicians and was warmed to 106°F before being administered to calves via esophageal feeder.

The colostrum replacer was mixed into two quarts of 106°F water before being administered via esophageal feeder.

After the initial colostrum or replacer feeding, farm personnel fed calves two quarts twice daily of waste milk in combination with a milk balancer (26% crude protein and 15% fat) to 15% solids until weaning at 46 days plus or minus three days of age. Calves were fed milk once daily for one week until moved out of the hutches. Starter was fed beginning after three days of age, while water was offered to calves starting at three days of age.

"Every calf born between 0100 and 0700 and between 0900 and 1500 hours were collected by research technicians blinded to the treatment administered to calves twice per day (0600 and 1400 hours) at 22-28 hours after feeding (n = 593)," the authors said.

The authors believed this clinical trial had the largest sample size comparing the effect of feeding a colostrum replacer versus maternal colostrum. "All 1,215 calves were used for evaluation of mortality, 1,214 for diarrhea treatment, 1,208 for respiratory disease treatment, 1,211 for fever, 594 for serum total protein at 24 hours, 592 for serum IgG at 24 hours, 96 for calculating AEA [apparent efficiency of absorption] of IgG at 24 hours, 268 for wean weight, 267 for average daily weight and 269 for wean height," they reported.

Calves fed colostrum gained 3.3 lb. more at weaning (P = 0.036) than those fed colostrum replacer (Table). Of course, there is no nutritional equivalency between colostrum and a colostrum replacer since colostrum has twice the solids and energy level of milk. In addition, colostrum has more than 200 bioactive compounds (Blum and Baumrucker 2002).

Consequently, there should be an epigenetic response to colostrum, as seen in the study by Faber et al. (2005). Thus, the additional daily gain with colostrum was likely due to nutrition, bioactive compounds and maybe IgG levels.

Levels of IgG in colostrum used in the study averaged 63.6 ± 17.7 mg/mL, with a range of 22.7-96.9 mg/mL, except for one outlier value of 1.96. Thus, the average IgG intake of calves given colostrum was calculated to be 178 ± 50 g, while the IgG intake of calves given the colostrum replacer was 150 g, or nearly 19% less than from colostrum. Colostrum with more than 50 mg/mL of IgG is considered to be of good quality.

Total serum protein and IgG were greater for calves provided with the colostrum versus the colostrum replacer in this study, although values greater than 5 g/dL of total serum protein and 15 mg/mL of IgG are considered adequate by most in the field. No differences in AEA indicated that IgG absorption was similar between colostrum and colostrum replacer, which contained colostrum-derived IgG.

Incidences of diarrhea, respiratory disease and fever did not differ by hazard ratio analysis between colostrum and

Bottom Line

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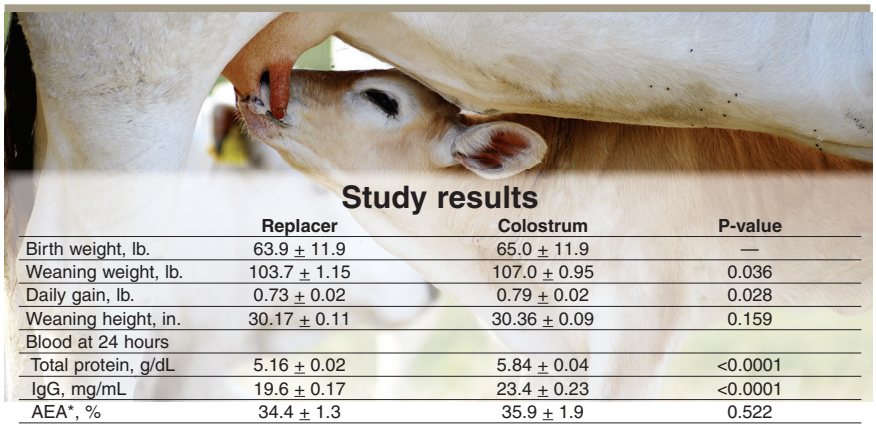

Study results

	Replacer	Colostrum	P-value
Birth weight, lb.	63.9 ± 11.9	65.0 ± 11.9	—
Weaning weight, lb.	103.7 ± 1.15	107.0 ± 0.95	0.036
Daily gain, lb.	0.73 ± 0.02	0.79 ± 0.02	0.028
Weaning height, in.	30.17 ± 0.11	30.36 ± 0.09	0.159
Blood at 24 hours			
Total protein, g/dL	5.16 ± 0.02	5.84 ± 0.04	<0.0001
IgG, mg/mL	19.6 ± 0.17	23.4 ± 0.23	<0.0001
AEA*, %	34.4 ± 1.3	35.9 ± 1.9	0.522

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colostrum replacer treatments. However, calves fed colostrum versus the replacer tended to have a lower probability of being treated.

The lower incidence of diarrhea could have been related to lower total bacteria counts in the colostrum replacer versus the colostrum. No colostrum replacer samples had coliform counts greater than 10,000 colony-forming units (CFU) per milliliter or total bacteria counts greater than 100,000 CFU/mL, although 80% of the colostrum samples in this study had total bacteria counts of fewer than 100,000 CFU/mL.

While there was no significant difference in mortality between the treatments in this study, death losses of 7.06% for the colostrum and 9.40% for the colostrum replacer were greater than desired.

The Bottom Line

In this study with more than 1,200 Jersey and Jersey x Holstein crossbred calves, a colostrum replacer with colostrum-derived IgG performed similarly to maternal colostrum of high quality (average of 63.6 mg/mL). While calves given three quarts of colostrum did gain about 3 lb. more weight at weaning, this most likely was due to the fact that more nutrients and bioactive compounds were present in the colostrum than in this colostrum replacer.

On the other hand, the colostrum replacer had lower total bacteria counts (1,579 CFU/mL) and no coliform counts versus an average of less than 20% with total bacteria counts of greater than 100,000 CFU.

While total serum protein and IgG levels were higher for the colostrum versus the replacer, the AEA of IgG was similar between treatments.

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