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Effects of a modified intensive milk replacer program fed two or four times daily on nutrient intake, calf growth and health

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Introduction

Dairy producers are seeking strategies to reduce labor costs, improve calf performance and improve health. Feeding the same amount of milk replacer in four meals vs. two meals may offer health and growth efficiency benefits to dairy calves when compared with the current industry standard of feeding twice daily. Automated calf feeders offer the opportunity to increase the number of meals per calf beyond the standard twice daily feeding frequency. Research at South Dakota State University demonstrated improvements in weight gain and calf health when feeding frequency increased from two to three times a day (Schingoethe et. al., 1986). We hypothesized that increased feeding frequency may result in increased starter intake when calves are fed on a high plane of nutrition. The objectives of this study was to determine if the milk replacer (MR) program standard 20% crude protein, 20% fat vs. modified 26% CP, 18% fat and feeding frequency (2 vs. 4 times daily) alters calf starter intake, growth and health.

Materials and Methods

This study was conducted between October 2009 and April 2010, at the University of Minnesota Dairy Research and Teaching Facility St. Paul, MN and used 48 Holstein and cross-bred heifer and bull calves (n=12). At birth, calves were removed from their dams, received colostrum, identified with numbered ear tags, and weighed (initial body weight (BW)). A serum sample was collected via jugular venipuncture 24 h after birth and an optical refractometer was used to measure serum total protein concentration. Each calf was assigned to one of four milk replacer treatments (TRT); 1) 20% CP, 20% fat MR fed at 1.5% of birth BW twice daily (TRT1, control); 2) 20% CP, 20% fat MR fed at 1.5% of birth BW 4 times daily (TRT2); 3) 26% CP, 18% fat MR fed at 2.0% of birth BW twice daily (TRT3); or 4) 26% CP, 18% fat MR fed at 2.0% birth BW 4 times daily (TRT4).

Calves fed four times daily vs. two times daily received the same nutrient amounts per day, but varied in the frequency and amount delivered at each feeding. Calves assigned to TRT1 and TRT3 were fed at 0600 and 1700 h and those assigned to TRT2 and TRT4 were fed two additional feedings at 1100 and 1400 h. Treatments were balanced by breed, sex, birth weight and total protein and averaged 93, 90, 91, and 91 kg of body weight at birth and 5.7, 5.7, 5.7 and 5.8 (mg/dL) total protein for TRT1, TRT2, TRT3, and TRT4 respectively. Calves were fed their respective treatments from day 1 until day 42 of age and all milk replacer feeding amounts were adjusted weekly based on BW to maintain 1.5% or 2.0% of BW feeding rate. Milk replacer was mixed with warm tap water to provide 15% solids for all treatments. Calves were weaned on day 42 by reducing the milk replacer feeding frequency by 50% on d 36 and by 100% by d 43.

Fecal scores (FS) ranging from 0-3 were assigned to the calves' fecal pats daily from 1 to 56 days of age, with scours defined as FS $\geq$ 2. Body weight, hip height, wither height, hip width, body length, and heart girth were measured weekly. Calves were offered a commercial texturized 18% crude protein calf starter ad libitum and provided water for ad libitum intake.

Starter refusals were measured daily and recorded at the 1400 h feeding. Milk replacer and starter samples were collected weekly and composited by month. Two calves assigned to TRT1 were replaced; one was replaced due to extremely poor performance and an abscess on its lower jaw and the second calf was replaced after it died. A third calf on TRT2 was replaced due to a leg injury.

Results

Least square means of BW on day of birth were not different among treatments. Average daily gain (ADG) during d 1-42 was not significantly different among treatments ($P = 0.19$) and averaged 0.27, 0.29, 0.31, and 0.34 kg/day for TRT1, TRT2, TRT3 and TRT4 respectively. ADG from d 1-56 was not different among treatments ($P = 0.13$) and averaged 0.62, 0.71, 0.78 and 0.79 kg/d for TRT1, TRT2, TRT3, and TRT4 respectively. There was no significant treatment or treatment × week interaction for measures of body length, hip width, or hip height. There was a tendency ($P = 0.08$) for a treatment × week interaction of wither height as accelerated fed calves tended to be taller at the withers. There was a significant treatment × week interaction ($P < 0.05$) for starter intake as calves on TRT2 consumed more starter on weeks six and seven than all other treatments. Least square means of starter intake (kg/d) were 0.88 for TRT1, 1.12 for TRT2, 0.81 for TRT3, and 0.75 for TRT4. Body weight was greater ($P < 0.05$;treatment × time) for TRT3 vs. TRT1 on week 8. Body weight gain from d 1 to 42 were not different ($P = 0.39$) among treatments and averaged 24.9 and 26.4 kg for TRT1 and TRT2 respectively, while TRT3 and TRT4 calves gained 28.8 and 29.8 kg respectively. Similarly, body weight gain from d 1 to 56 was not significantly different among treatments ($P = 0.18$) and averaged 34.9, 40.1, 43.9, and 42.2 kg for TRT1, TRT2, TRT3 and TRT4 respectively. Fecal scores and respiratory scores did not differ among treatments.

Significance

Feeding four times daily resulted in higher starter intake when calves were fed a 20:20 milk replacer. This higher starter intake resulted in 5.2 kg additional body weight gain for calves fed four times daily through day 56. Feeding a 26:18 milk replacer four times daily did not result in significant improvements in growth or starter intake, however, calves fed the 26:18 milk replacer four times daily had slightly higher ADG than those fed twice daily. As expected, calves fed the modified accelerated program showed some growth enhancements over the conventional milk replacer program. Overall, there was a low incidence of scours throughout the study. Further research should confirm these results with more calves per treatment and with the use of labor saving technology such as an automated calf feeder.

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