

Ruminant Nutrition: Dairy: Calf Nutrition and Feed Additives

644 Use of plasma, hydrolyzed wheat gluten, or the combination in dairy calf milk replacers. T. M. Hill*, H. G. Bateman III, J. M. Aldrich, J. D. Quigley, and R. L. Schlotterbeck, *Nurture Research Center, Provim North America, Brookville, OH.*

Plasma and hydrolyzed wheat gluten are relatively well accepted alternatives to milk ingredients in the US. Five milk replacer powders that were: all milk protein control (M), 6% plasma (P), 6% hydrolyzed wheat gluten (W), 3% plasma and 3% hydrolyzed wheat gluten (LOPW), and 6% plasma and 6% hydrolyzed wheat gluten (HIPW). The MR were 27% CP, 17% fat, equalized in amino acids to published optimum concentrations using synthetic sources, and fed at 0.66 kg DM/calf daily until weaning at d 28. Post-weaning measurements were made until d 56. A textured 20% CP starter and water were fed free-choice all 56 d. Calves (20/treatment) were 2 to 3 d old Holstein male calves (46 ± 1.2 kg BW) sourced from a single farm and housed in individual 1.2 by 1.4 m pens within a naturally ventilated nursery. The nursery temperature averaged 14°C ranging from -4 to 30°C based on hourly measurements. Data were analyzed as a completely randomized block design using repeated measures with means separated using pre-planned contrasts (M vs. others, M vs. P, M vs. W, LOPW vs. HIPW). Starter intake, ADG, and change in hip width were greatest for calves fed M ($P < 0.05$, M vs. others, M vs. P, M vs. W). Pre-weaning ADG was 0.440, 0.408, 0.395, 0.376, and 0.366 kg/d (SEM = 0.024 kg/d) for M, P, W, LOPW, and HIPW, respectively. Overall 56 d ADG was 0.560, 0.494, 0.473, 0.519 0.468 kg/d (SEM = 0.034 kg/d) for M, P, W, LOPW, and HIPW, respectively. Overall 56 d hip width change was 3.7, 3.3, 3.3, 3.4, 3.2 cm (SEM = 0.2 cm) for M, P, W, LOPW, and HIPW, respectively. Medical treatments were low and not different among treatments. Depending upon the feed ingredient market, it was estimated that the milk replacers with alternative proteins would need to be 10 to 20% less expensive than M to equalize the feed cost per unit ADG. Under the conditions of this trial, replacing $\geq 18\%$ of the milk protein with plasma or hydrolyzed wheat gluten alone or in combination was not advantageous.

Key Words: milk replacer, plasma, hydrolyzed wheat gluten

645 Standing time of dairy calves within a naturally ventilated, unheated nursery over different seasons of the year, fed different amounts of milk replacer, and housed individually or in groups. T. M. Hill*, H. G. Bateman III, J. M. Aldrich, J. D. Quigley, and R. L. Schlotterbeck, *Nurture Research Center, Provim North America, Brookville, OH.*

Holstein calves (2 to 5 d of age initially) from a single dairy farm were transported 3.5 h to the Nurture Research Center in southwest OH in 6 different 56-d periods. Standing and lying behavior was measured using an electronic data logger attached to the medial side of the right rear leg of calves. Data were analyzed as completely randomized designs using repeated measures with calf being the experimental unit. Period, time of day, and/or treatment (MR program or housing) were factors in the model. In the first 4 periods, calves were housed in 1.2 by 2.4 m individual pens with wire mesh sides within a curtain sidewall barn with no added heat. Pens were bedded with long straw. Calves were fed 0.66 kg DM of milk replacer (MR) powder in 2 equal meals at 0615 and 1600 h. Starter and water were offered free-choice. Calves were weaned at 42 d. The first 4 periods were seasons of the year and there were 10 calves/period combined in the analysis. Standing time did not differ among periods and averaged 303 ± 52.8 min/d. Standing time differed ($P <$

0.05) throughout the day and was greatest during AM and PM feeding, intermediate during midday and evening, and least at night. There was no interaction of period of year by time of day. In period 5, standing time was measured for calves (10/treatment) fed ad libitum MR or the fixed amount of 0.66 kg DM/d. In period 6, standing time was measured for calves (6/treatment) fed ad libitum MR in groups of 3 calves, individually, or fed 0.66 kg DM/d in individual housing. In periods 5 and 6, total time standing/d or throughout the day did not differ by feeding rate or grouping. In summary, calves averaged approximately 300 min/d standing to approximately 2 mo of age independent of season of the year, feeding rate of MR, or housing as individuals or groups of calves.

Key Words: standing time, behavior, season

646 Replacing 10 and 20% of dairy calf milk replacer with whey cream yields similar starter intake, growth, and health performance during the nursery phase. R. J. LaBerge*¹, R. S. Younker², and N. B. Litherland¹, ¹University of Minnesota, St. Paul, ²Milk Specialties Global, Eden Prairie, MN.

Whey cream (WC) is a byproduct of whey protein concentrate production and contains milk nutrients and potentially healthful functional food compounds. Our objective was to determine if replacing a proportion of all milk protein calf milk replacer (CMR) with increasing amounts (0, 10, and 20%) of WC affects calf growth and health. Seventy-two male ($n = 33$) and female ($n = 37$) Holstein and Holstein-cross dairy calves were raised in hutches from October to January and randomly assigned to 1 of 3 nonmedicated CMRs formulated to provide 22% protein and 20% fat; (1) 0% WC (0WC); (2) 10% WC (10WC); (3) 20% WC (20WC). CMR was fed at 1.5% of birth body weight (BBW) and reconstituted to 13% solids. BBW and serum total protein concentration averaged 40.4 ± 0.7 kg and 6.3 ± 0.07 mg/dL, respectively. Calves were fed CMR twice daily (0630, 1700 h) d 1 to 41, once daily d 42 to 48, weaned d 49, and removed from trial d 56. Starter (19.9% CP, DM basis) and drinking water were provided ad libitum. Daily starter intake, thrice weekly fecal score, and weekly growth [body weight (BW), wither height (WH), hip height (HH), hip width (HW), body length (BL), heart girth (HG)] were measured. Data were analyzed using PROC MIXED in SAS as a randomized block design. Starter consumed through d 56 averaged 1.0, 1.1, and 1.1 ± 0.08 kg ($P < 0.22$), and ADG averaged 0.83, 0.91, 0.84 ± 0.05 kg ($P < 0.13$), and gain:feed through d 56 averaged 0.55, 0.58, 0.53 ± 0.03 ($P < 0.18$), for 0WC, 10WC, and 20WC, respectively. 20WC calves tended ($P < 0.08$) to consume more starter than 0WC by d 49, and 10WC calves consumed 500 g/d of starter 2.3 ± 1.8 d before 0WC ($P < 0.03$). WH, HH, HW, BL, and days treated for illness were similar among treatments. Calves fed 0WC had greater HG gain over 20WC and 10WC ($P < 0.05$). Days scouring were similar but average fecal score tended to be less for 10WC over 0WC calves ($P < 0.09$). Results indicate that replacing CMR with up to 20% WC successfully resulted in some tendencies for calf growth and health.

Key Words: nursery calf, whey cream, milk replacer

647 Feeding dairy calves once or twice a day: Effects on solid feed intake and ruminal physico-chemical parameters from birth to weaning. C. Julien*^{1,2}, F. Enjalbert^{1,2}, and C. Bayourthe^{1,2}, ¹INRA, UMR1289 TANDEM, Tissus Animaux Nutrition Digestion Ecosystème et Métabolisme, Castanet-Tolosan, France, ²Université de Toulouse,

The experiment tested a simplified feeding program for dairy calves (Technique Once a Day, Bonilait-Protéines, France). Sixteen male Holstein calves from birth (d 1) to weaning (d 63) were reared in individual pens. Two feeding programs were tested. Each was based on a milk replacer (MR) with the same chemical composition: 20% CP and 18% fat, on DM basis. Calves were divided into 2 groups at 4-d of age: (1) OAD (n = 8): calves received MR once a day (200 g/L of MR), (2) TAD (n = 8): calves received MR (125 g/L) twice a day; volume distributed per calf and per meal varied with age but did not differ between groups. The week before weaning, all calves received MR once a day. All calves received water, wheat straw and a starter concentrate (16.6% CP) ad libitum. Individual straw and concentrate intake were recorded daily. Ruminal samples were taken through a stomach tube at birth and thereafter at a 7-d interval. The pH and oxidation-reduction potential (ORP) of ruminal content were measured after a 20 min-stabilization

period. Data were analyzed as a mixed model with repeated measures using R.14.1 software with calf as random effect, age and treatment as fixed effects. Body weight of calves and straw intake did not differ ($P > 0.10$) from birth to weaning between treatments. Ruminal pH averaged 6.25 and did not differ with age and treatment. From d 42 to d 56, calves fed OAD presented a more acidic ruminal content than TAD calves (5.94 and 6.65 on average for OAD and TAD, respectively, $P = 0.05$) which could originate from a nonsignificant but numerically higher intake of starter by OAD calves: +14% on average from d49 to d56. Ruminal ORP tended to be higher with OAD than TAD from birth to weaning ($P = 0.08$) and differed between groups from d 42 to d 56 ($P = 0.007$): -131 and -172 mV for OAD and TAD calves, respectively. These differing physico-chemical ruminal conditions observed before weaning could suggest that the feeding program altered ruminal microbiota composition and richness, which needs further investigations for confirmation.

Key Words: calf, rumen, ORP