Growth and Development I

300 Evaluating the effect of protein source and micro-encapsulated sodium butyrate in starter mixtures on gastrointestinal tract development of dairy calves. K. Burakowska*[1], M. Przybylo[2], G. Penner[1], and P. Górka[2], [1]*University of Saskatchewan, Saskatoon, SK, Canada,* [2]*University of Agriculture in Krakow, Krakow, Poland.*

The objective of this study was to determine the effect of soybean meal (SB) or canola meal (CM) with or without inclusion of micro-encapsulated sodium butyrate (MSB) in calf starter mixtures on gastrointestinal tract (GIT) development. Twenty-eight Holstein-Friesian bull calves (8.7 ± 0.8 d of age, 43.0 ± 4.4 kg at the start of the study) were blocked by date of birth and initial BW and fed 1 of the 4 pelleted starters containing (1) SB; (2) SB+MSB; (3) CM and (4) CM+MSB. Crude protein (CP) content of the starters was (%DM): 1) 21.9; 2) 21.7; 3) 20.7 and 4) 20.3. The CM constituted 35.2%, SB 24.2% and MSB 0.3% of the respective starters DM. Calves were fed milk replacer (MR, 21.7% CP) at 0.85 kg/d for 35 d and then 0.43 kg/d for following 7 d. Calves were weaned at 51.7 ± 0.8 d of age and were killed at 72.1 ± 0.9 d of age. The GIT was dissected for morphometry measurements and tissue samples were used for histological assessment and brush border enzyme activity determination. Data were analyzed as a 2 × 2 factorial design. Pre-weaning starter DMI was greater for SB compared with CM (256 vs. 229 g/d; $P = 0.01$) and tended to be greater for MSB supplementation (232 vs. 253 g/d, $P = 0.06$), but MR intake was not affected. Mucosa surface area in the cranial ventral sac of the rumen was less for MSB (950 vs. 1197 mm^2/cm^2, $P = 0.02$). Jejunum tissue mass was lower for SB than CM (2.13 vs. 2.43 kg, $P = 0.05$). For calves fed MSB, aminopeptidase A activity tended to be greater in the duodenum (1.68 vs. 2.82 U/mg protein × 10^{-3}; $P = 0.07$) and was greater in ileum (8.89 vs. 13.30 U/mg protein × 10^{-3}, $P = 0.02$), and aminopeptidase N activity tended to be greater in the ileum (31.50 vs. 38.46 U/mg protein × 10^{-3}, $P = 0.07$). The use of CM in comparison with SB may reduce pre-weaning starter intake and average daily gain at weaning. MSB might benefit the calf pre-weaning by increasing starter intake and activity of aminopeptidases. However, MSB did not affect ADG or starter intake after weaning, and papillae surface area in the ventral sac of rumen was reduced.

Key Words: canola meal, butyrate, gastrointestinal tract

301 Effects of feeding milk replacer with increased fat on intake and performance of calves during the summer months in northern New York. K. Hultquist*, C. Ballard, and C. Havekes, *William H. Miner Agricultural Research Institute, Chazy, NY.*

The objective of this study was to evaluate the addition of fat to milk replacer as a supplemental energy source to reduce the negative effects of heat stress on growth and performance of dairy calves. Sixty calves (27 heifers and 33 bulls) housed in individual hutches were enrolled in a randomized block design from June 7 to Oct. 7, 2016 with THI ranging from 33 to 81. Calves were blocked by age and sex and randomly assigned to treatment: 1) milk replacer with no added fat (CON), 2) milk replacer with added fat when daily temperature exceeded 26°C (FTEMP), and 3) milk replacer with added fat for all study days (FALL). Calves were fed the same amount of milk replacer (26% crude protein, 18% fat, and 13% solids) twice daily following a step-up/step-down feeding strategy from 2 to 57 d of age. Fat was added at 1.2% of total reconstituted milk replacer for FTEMP and FALL increasing total solids to 14.2%. Calves had ad libitum access to a pelleted starter and water. Body weight, hip height, hip width, serum glucose, and serum nonesterified fatty acids were measured weekly. Intakes and health (body temperature, respiration, skin tent, eye recession, cough, nasal discharge, and fecal) were evaluated daily. Intake, growth, and feed efficiency data were averaged by week and analyzed using the GLIMMIX procedure of SAS. Health data were analyzed using logistic regression. The effect of feeding treatments was assessed using preplanned contrasts, comparing CON vs fat supplementation (FS = FTEMP + FALL) and FTEMP vs FALL. Average daily gain was 0.06 kg/d greater for FS from 2 to 43 d of age before weaning started. However, overall average daily gain (2 to 57 d) was not significant among treatments. Hip height and hip width also did not differ among treatments. Dry matter intake was increased for FS resulting in greater overall feed efficiency for CON-fed calves. Serum nonesterified fatty acids were greater for FS than CON. Calves fed FS had higher respiration rates with FALL being greater than FTEMP. All other health parameters were similar among treatments. The results of this study indicate that calves did not benefit from fat supplementation during the summer months.

Key Words: calf, fat supplementation, heat stress

302 Effects of prebiotic and phytogenic milk replacer additives on growth and feed utilization of Holstein rearing calves. T. Wilke*[1] and H. Westendarp[2], [1]*Dr. Eckel Animal Nutrition GmbH & Co KG, Niederzissen, Germany,* [2]*Faculty of Agricultural Sciences and Landscape Architecture, University of Applied Sciences, Osnabrück, Germany.*

Various prebiotic and plant feed additives claim to promote growth and proper development of the gastrointestinal tract by different modes of action. Objective of this study was to compare the effects of 2 feed additives for milk replacers on growth and feed conversion of dairy calves. The trial was conducted from October 2015 to May 2016 in North-Western Germany with 80 female Holstein rearing calves of one dairy herd. At d 4 postpartum (BW 44.9 ± 5.2 kg) calves were assigned to 2 treatment groups (A and B). Calves of group A were fed a milk replacer (160 g per liter) enriched with a prebiotic preparation (0.3% dry powder) of calcium gluconate, calcium and sodium carboxylates, fructooligosaccharides (scFOS) and a plant extract (AntaTop MAT, Dr. Eckel Animal Nutrition, Germany). The milk replacer of group B contained a mixture of a plant extract rich in benzophenanthridine alkaloids and organic acids (0.3% dry powder). Milk replacer intake was measured individually (n = 80). Calf starter feed was offered from d 14 (max. Two kg/calf/day) and roughage from d 21 (ad libitum). Body weight was measured at d 4, 14, 40 and 64 postpartum. Data were analyzed using ANOVA (IBM SPSS). During the main feeding period (d 14 - 40) daily weight gain was significantly higher ($P < 0.05$) in group A (prebiotic) (927 ± 181 vs. 821 ± 252 g/d). Daily weight gain over the whole period (d 4 - 64) was not statistically different ($P < 0.05$) between treatments A and B (878 ± 119 vs. 860 ± 137 g/d). Calves of group A needed 5.6 kg (±1.58) less ($P < 0.01$) milk replacer powder (72.0 vs. 66.4 kg) to achieve this weight gain. Consequently, feed conversion of milk replacer into body mass was significantly lower ($P < 0.01$) in the prebiotic group (A) than in the alkaloid group (B) (1.28 ± 0.22 vs. 1.41 ± 0.21 kg/kg). Calves of the prebiotic group (A) consumed more roughage (45.8 ± 6.9 vs. 41.7 ± 11.6 kg dry matter) and more calf starter feed (15.2 ± 3.5 vs. 10.9 ± 3.9 kg dry matter). Differences in roughage and starter intake were not significant ($P > 0.20$). The results indicate that efficiency of dairy calf feeding can be improved by a prebiotic additive in milk replacer.

Key Words: calf feeding, feed additive, prebiotics