Ruminant Nutrition: Dairy Production IV

798 Sampling behavior of dairy cattle: Effects of spatial variation in feed quality on movements at the feed bunk. J. M. Huzzey,* J. A. Fregonesi, M. A. G. von Keyserlingk, and D. M. Weary, *University of British Columbia, Animal Welfare Program, Vancouver, BC, Canada.*

The factors affecting feed sampling behavior of cattle housed indoors are poorly understood. The objectives of this study were to measure the effects of spatial variation in feed quality on the feeding behavior of Holstein dairy heifers. Thirty-two heifers were housed in 4 groups of 8. Pens had 8 distinct feeding stations (FS). Three TMR qualities were used in the study: low energy (TMR-L), moderate energy (TMR-M), and high energy (TMR-H). During trial 1 (d 1 to 8), heifers were offered a uniform baseline diet (TMR-M to all 8 FS) interspaced with 2 uniform test diets on d 3 and 6 (TMR-L or TMR-H). During trial 2 (d 9 to 17) heifers were offered a non-uniform baseline diet (7 FS: TMR-L, 1 FS: TMR-H) interspaced with 3 uniform test diets on d 11, 14, and 17 (TMR-L, TMR-M, or TMR-H). Heifers were observed in pairs (n = 16) continuously for 15 min following fresh feed delivery each morning. Frequency of switches between FS and competitive displacements were recorded. Pair was considered the experimental unit. During trial 1 the average (±SE) number of FS switches per min when fed the uniform baseline diet was 0.68 ± 0.10; this was lower than when fed a TMR-L (1.34 ± 0.10; $P < 0.001$) and tended to be higher than when fed a TMR-H (0.44 ± 0.10; $P = 0.06$). Displacement frequency did not differ between dietary treatments in trial 1 ($P > 0.14$). During trial 2 the number of FS switches per min when fed the non-uniform baseline diet was 0.87 ± 0.09; this was lower than when fed a TMR-L (1.16 ± 0.09; $P = 0.01$) but higher compared with the TMR-M and TMR-H diets (0.56 and 0.38 ± 0.09, respectively; $P \le 0.007$). Heifers engaged in more displacements per min when fed a non-uniform TMR (0.13 ± 0.03) than when fed TMR-M (0.06 ± 0.03; $P = 0.04$) or the TMR-L and TMR-H diets (0.07 ± 0.03 for both; $P \le 0.11$). Dairy heifers appear to sample feed quality by changing feeding locations at the feed bunk; this sampling behavior is affected by variability in the energy density of the diet.

Key Words: sampling behavior, diet uniformity, agonistic interactions

799 Effect of precision feeding on performance, nutrient excretion, and feeding behavior of early lactation dairy cows. E. Maltz*[1,2], L. F. Barbosa[1], P. Bueno[1], L. Scagion[1], L. F. Greco[1], K. Kaniyamattam[1], A. de Vries[1], and J. E. P. Santos[1], *[1]University of Florida, Gainesville, [2]The Volcani Center, Bet Dagan, Israel.*

Objectives were to evaluate the effects of 2 feeding strategies on performance of early lactation cows. Fifty-eight Holstein cows at 21 DIM were randomly assigned to a control [n = 29; 16.2% CP, 1.64 Mcal of NE_L, 22% starch, and 19% forage NDF] or a precision diet [n = 29, 16.2% CP, 1.59 to 1.68 Mcal NE_L, 18 to 26% starch, and 16 to 22% forage NDF] that varied in the caloric density based on energy balance (EB) of cows. The TMR of precision cows were adjusted individually once a week according to the EB and DMI of the preceding week. The study lasted 16 wk, and nutrient digestibility, rumen fluid composition, microbial protein synthesis, and feeding behavior were evaluated. Data were analyzed with the GLIMMIX procedure of SAS. The mean diet NE_L was greater ($P < 0.01$) for precision than control cows (1.65 vs. 1.64 Mcal/kg) because of greater ($P < 0.01$) dietary concentrate (55.0 vs. 52.3%). Compared with controls, precision cows had similar DMI (24.3 kg/d), but NE_L intake tended ($P = 0.10$) to be greater (40.6 vs. 39.1 Mcal/d) because of greater caloric intake in the first 6 wk of the study. Yields of milk (45.2 vs. 41.9 kg/d), 3.5% FCM (44.0 vs. 40.8 kg/d) and milk protein (1.33 vs. 1.23 kg/d), and the feed conversion ratio (3.5% FCM/DMI; 1.82 vs. 1.74) were greater ($P < 0.05$) in precision compared with control cows. Precision cows produced more ($P < 0.05$) milk calories per kg of $BW^{0.75}$ (0.227 vs. 0.213 Mcal of NE_L/kg), although the proportion of consumed calories (82.3%) and N (37.4%) partitioned into milk did not differ between treatments. Digestibility of nutrients, composition of rumen fluid, rumen pH and microbial N synthesis remained mostly unaltered by treatments. Meal pattern differed, and precision cows consumed feed more sparsely throughout the day, spent more time ruminating lying, had similar meal length (36.3 min/meal) compared with control cows, but smaller ($P < 0.05$) meal size (3.33 vs. 3.64 kg/meal). Results indicate that allocating dietary resources according to individual needs of cows based on EB improves lactation performance compared with feeding a single TMR despite minor changes in caloric intake.

Key Words: dairy cow, feeding behavior, precision feeding

800 Concentrate levels and supplemental fat for grazing mid lactating cows. F. L. Macedo, S. F. Angolini, W. F. Angolini, C. T. dos Santos Dias, and F. A. P. Santos,* *University of São Paulo, Piracicaba, SP, Brazil.*

A grazing trial was conducted to evaluate the production response of mid lactating dairy cows to concentrate levels and supplemental fat. Twenty-two Holstein x Jersey cows were assigned to randomized blocks according to number of lactation (primiparous or multiparous), DIM (132 ± 60) and milk yield (20.9 kg d^{-1} ± 2.22), in a 2x2 factorial arrangement. Treat ments were: 1) HS: High supplementation (1 kg of concentrate for every 2.5 kg of milk); 2) LS: Low supplementation (1 kg for every 5 kg of milk); 3) HSCS: HS with 2.78% of calcium salt (CS) of soybean oil (Megalac-E®); 4) LSCS:LS with 5.76% CS of soybean oil. Cows grazed fertilized Elephant grass pastures during 90 d. Concentrates were 15.2% CP (HS and HSCS) or 12% CP (LS and LSCS), based on fine ground corn. Data were analyzed using GLM procedure of SAS (1999) and effects were significant at P-value of < 0.05. Hand plucked samples of forage contained 18.6% CP and 54.4% NDF. Feeding HS decreased forage DMI (9.3 vs. 12.2 kg d^{-1}) with no changes in total DMI (16.5 vs. 15.2 kg d^{-1}). Fat supplementation had no effect on forage and total DMI ($P > 0.05$). There was an interaction for concentrate level and fat supplementation for milk yield ($P < 0.05$). Feeding HS increased milk yield (17.6 vs.14.2 kg d^{-1}) compared with LS when fat was not fed, but concentrate level had no effect when fat was fed (15.4 vs. 15.0 kg d^{-1}). Fat supplementation had a negative effect on milk yield when cows were fed with HS (17.6 vs. 15.4 kg d^{-1}) but not with LS (14.2 vs. 15.0 kg d^{-1}). Milk fat content was decreased ($P < 0.05$) by feeding either HS (3.53 vs. 3.60%) or fat (3.76 vs. 3.38%) with no interaction ($P > 0.05$). Content of milk protein, casein and lactose were not affected by treatments ($P > 0.05$) and MUN was decreased by feeding HS ($P < 0.05$). Plasma glucose was not affected ($P > 0.05$) by treatments but feeding HS decreased plasma NEFA ($P < 0.05$).

Key Words: calcium salts of soybean oil, grazing dairy cows, supplementation

801 Dry matter intake and behavior patterns of dairy cows fed diets combining pasture and total mixed ration. A. Mendoza[1,2], C. Cajarville*[3], R. Colla[1], G. Gaudentti[1], M. E. Martín[1], and J. L. Repetto[1], [1]*Facultad de Veterinaria, Departamento de Bovinos, Montevideo, Uruguay,* [2]*Instituto Nacional de Investigación Agropecuaria, Colonia, Uruguay,* [3]*Facultad de Veterinaria, Departamento de Nutrición Animal, Montevideo, Uruguay.*

Nine Holstein cows (mean BW = 572 kg; SD = 76) fed a total mixed ration (TMR) were assigned to 3 3 × 3 latin squares (each with 10 d of adaptation followed by 10 d of sampling) to evaluate the effect of 0 (TMR0), 4 (TMR4) or 8 (TMR8) hours of daily access to fresh pasture on DMI and behavior patterns. Pasture (*Lolium multiflorum*; 22.1% CP, 24.0% ADF) was daily cut and offered ad libitum from 0800 h in individual stalls and TMR (16.8% CP, 16.4% ADF) was offered ad libitum during the remaining time. Daily DMI was measured for 7 consecutive days by weighing the amount of feed offered and refused. Behaviors (eating (EAT), ruminating (RUM), and others (OTH)) were recorded during one day using instantaneous sampling of each cow using 5 min scan sampling for 12 h after 0800 h. Mixed and general linear models were used to test main effects for traits with or without repeated measurements, respectively. Pasture DMI increased and TMR DMI decreased with time of access to pasture (TMR0 = 0 and 24.5 kg; TMR4 = 2.8 and 22.8 kg; TMR8 = 3.6 and 19.0 kg; SEM = 0.5 and 1.5, respectively) while total DMI intake was higher in TMR4 than TMR8 cows (25.6 vs 22.6 kg), but no differences were detected with TMR0 (24.5 kg; SEM = 1.6). Proportion of cows EAT (0.43; SEM = 0.03), RUM (0.25; SEM = 0.02) or OTH (0.31; SEM = 0.02) were not affected by treatments, but an effect of hour and treatment × hour were detected for these traits ($P < 0.01$). After hour 1, the proportion of cows EAT decreased and RUM and OTH increased in every treatment, but at hour 5 (after TMR4 cows were changed to TMR feeding), the proportion of TMR4 cows EAT was higher than in TMR0 and TMR8 cows (0.81, 0.46, 0.10, respectively) and RUM lower than in TMR0 and TMR8 cows (0.05, 0.20, 0.49, respectively). At hour 9 (after TMR8 cows were changed to TMR feeding) the proportion of TMR8 cows EAT was higher than in TMR0 and TMR4 cows (0.90, 0.42, 0.59, respectively) and RUM lower than in TMR0 and TMR4 cows (0.01, 0.27, 0.19, respectively). Time of access to fresh pasture influenced both DMI and behavior of TMR-fed dairy cows.

Key Words: pasture, total mixed ration

802 Supplemental fat for dairy calves fed accelerated milk replacer during mild cold stress. N. Litherland*[1], D. Lobao[1], R. LaBerge[1], W. Weich[1], Z. Sawall[1], J. Schefers[1], and A. Kertz[2], [1]*University of Minnesota, St Paul,* [2]*ANDHILL LLC, St, Louis, MO.*

Sixty Holstein and Holstein-cross dairy calves (31 female and 29 male) fed accelerated milk replacer (MR) were used to determine response to increasing amounts of supplemental fat during mild cold stress. Calves (n = 20) were randomly assigned to one of 3 treatments; 1) Low fat (LF) (28:15 MR; 2) Medium fat (MF) (28:15 MR + 113 g/d commercial fat supplement (FAT) (60% fat); 3) High fat (HF); 28:15 MR + 227 g/d FAT. MF and HF calves received FAT d 1–21. All calves were fed LF d 22–49. MR was fed at 1.4% of birth body weight (BBW) d 1–10 and then 1.8% of BBW d 11–42 and 0.9% of BBW d 43–49 Weaned on d 49 and remained in hutches to d 56. MR was reconstituted to 13% solids. Calves were fed ad libitum a commercial starter grain (19.2% CP) and offered 4 L/d warm water. Calves were fed MR twice d at 0630 and 1730 in hutches bedded with straw. Starter intake (SI), MR intake (MRI), and ambient temperature (AT) were measured daily and body weight (BW), hip height (HH), and body length (BL) were measured weekly. Data were analyzed using PROC MIXED in SAS as a randomized design. Calf BBW averaged 42.0 ± 1.0 kg ($P = 0.41$), total serum protein averaged 5.8 ± 0.1 mg/dL, and birth AT averaged 5.0 ± 1.1°C. Average daily gain (ADG) was similar among treatments through 21 d and averaged 0.59, 0.76, and 0.68 ± 0.1 kg/d and through 56 d averaged 0.81, 0.84, 0.83 ± 0.1 kg/d for LF, MF and HF. Through 56 d SI averaged 1.1, 1.0, 0.9 ± 0.1 kg/d for LF, MF and HF and was higher ($P < 0.05$) for LF vs HF. Cumulative starter intake was similar among treatments on d 21, 42, and 56 but was 10.4 kg higher ($P < 0.05$) for LF vs. HF on d 49. Gain of HH on d 56 tended ($P = 0.09$) to be greater and d 49 BL gain tended ($P = 0.06$) to be greater for LF vs. HF. Gain:feed on d 56 ($P = 0.50$) averaged 0.81, 0.84 and 0.83 ± 0.02 for LF, MF and HF. Retrospective analysis showed calves with BBW <40.0 kg fed MF tended ($P = 0.08$) to have higher 21 d BW gain than LF. Calves with BBW >40.0 kg fed HF had greater ($P < 0.05$) 21d BW gain than MF with LF intermediate. Supplementing fat to nursery calves fed accelerated MR decreased SI through d 21 which had carryover effects on SI on d 49 but did not alter ADG, total gain or feed efficiency.

Key Words: accelerated milk replacer, supplemental fat, nursery calf

803 What do preweaned and weaned calves need in the diet: A high fiber content or a forage source? M. Terré*[1], E. Pedrals[1], and A. Bach[2,1], [1]*Institut de Recerca i Tecnologia Agroalimentàries, Caldes de Montbui, Spain,* [2]*Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain.*

The objective of this study was to determine whether the improvement of the performance of young calves associated with the supplementation of chopped grass hay is due to an increase of the total NDF content of the consumed diet or to the provision of chopped grass hay. Sixty-three Holstein calves (9 ± 4.4 d old) were randomly distributed in 4 treatments resulting from the combination of 2 levels of NDF content of a pelleted starter and the supply or absence of forage provision: low NDF starter (18%) with or without chopped oat hay, and high NDF starter (27%) with or without chopped oat hay. All animals were fed the same milk replacer (21% CP, 19.2% fat) at the rate of 4 L/d at 15% DM from d 1 to 34, and 2 L/d at 15% DM from d 35 to 42 (weaning). The study finished 2 wk after weaning. Body weight was measured weekly, and individual calf starter and hay intake was recorded daily. On d 50, blood samples were obtained 2 h after the morning concentrate offer to determine serum glucose and insulin concentrations. On d 52, ruminal fluid samples were obtained via an esophageal tube, and pH was measured immediately. Data were analyzed with a mixed-effects model with repeated measures, except for pH values that had no repeated measures. During the preweaning period, starter intake was similar among treatments, but ADG tended ($P = 0.053$) to be greater in low NDF than in high NDF treatments (0.69 vs. 0.63 ± 0.020 kg/d, respectively). However, during the 2 wk after weaning, supplementation of forage improved ($P < 0.05$) concentrate intake and ADG without affecting the gain to feed ratio. Probably, the greater starter intake observed in forage-supplemented calves was mainly due to the greater ruminal pH found in forage-supplemented calves compared with forage-deprived calves (5.81 vs. 5.05 ± 0.063, respectively). On the other hand, the insulin to glucose ratio was greater ($P < 0.05$) in forage-supplemented compared with non-forage calves (6.53 vs. 4.24 ± 0.125 ng/L to mg/dL, respectively). In conclusion, a low NDF starter should be recommended during the preweaning period, and the provision of chopped hay is necessary right after weaning to improve calves performance.

Key Words: forage, NDF content, young calves

804 Fat and fatty acid sources affect growth and health of milk-fed calves. K. M. Esselburn*[1], K. M. Daniels[1], T. M. Hill[2], H. G. Bateman II[2], J. M. Aldrich[2], and R. L. Schlotterbeck[2], *[1]Department of Animal Sciences, The Ohio State University, Ohio Agricultural Research and Development Center, Wooster, [2]Nurture Research Center, Provimi North America, Brookville, OH.*

Fatty acid profiles of milk and milk replacer (MR) differ. Calf MR in the US are made from lard or tallow, which are low in short- and medium-chain fatty acids and linolenic acid. This 56-d trial compared a control MR containing 27% CP and formulated with 3 fat and fatty acid compositions. The 3 MR treatments were A) only lard totaling 17% fat, B) animal fat supplemented with butyrate, medium chain fatty acids, and linolenic acid using a commercial product (1.25% NeoTec4 MR, Provimi North America, Brookville, OH) totaling 17% fat, and C) milk fat totaling 33% fat. Holstein calves (24 female, 24 male; 41 ± 1 kg initial BW; 2 to 3 d of age) from a single farm were fed 660 g of DM from MR for 42 d and weaned. Starter (20% CP) and water were fed ad lib for 56 d. Calves were housed in a naturally ventilated nursery with added heat during the summer of 2011. Calves were in individual pens with straw bedding. Pen was the experimental unit. Data were analyzed as a completely randomized design with a 3 (MR treatment) by 2 (sex) factorial arrangement as a repeated measures mixed model. Pre-planned contrast statements of treatments A vs. B and A vs. C were used to separate means. There were no interactions of MR treatment by sex. Starter intake did not differ. Calf ADG and feed efficiency differed ($P < 0.05$; A < B, A < C). Pre-weaning days with scours differed ($P < 0.05$; A > B). Titers to bovine respiratory parainfluenza-3 and bovine virus diarrhea type 1 (vaccinations to these pathogens were on d 7 and 28) in serum samples taken on d 49, and 56 differed ($P < 0.05$; A < B). Concentrations of urea nitrogen and glucose in serum samples taken on d 7, 21, 28 differed ($P < 0.05$; A > B, A > C). The MR with lard was less optimal than the other 2 MR for baby calf growth and health.

Key Words: fat, fatty acids, dairy calf

805 Fatty acid profile and global gene expression in liver of calves supplemented with linoleic acid. M. Garcia*[1], L. F. Greco[1], M. B. Rabaglino[1], A. L. Lock[2], W. W. Thatcher[1], J. E. P. Santos[1], and C. R. Staples[1], *[1]University of Florida, Gainesville, [2]Michigan State University, East Lansing.*

Aim was to assess the fatty acid (FA) profile and global expression of genes in liver of calves fed increased linoleic acid (LA) during the first 30 d of life. Within 2 h of birth, bull calves (n = 31) were fed 4 L of good quality colostrum and assigned randomly to receive milk replacer (MR) with low (LLA, 0.56% LA) or high concentration of LA (HLA, 1.78% LA, DM basis) twice daily at 6.7 g of fat per kg of metabolic BW. Amounts fed were adjusted weekly. Liver biopsy was performed at 30 d of age. Microarray analysis (n = 9 per MR) was performed using GeneChip Bovine Genome Array from Affymetrix; transcriptome expression was analyzed by one-way ANOVA. The HLA treatment upregulated 236 genes whereas 265 genes were downregulated ($P < 0.05$, fold change ratio ≥1.3). KEGG pathway analyses were employed with WebGelstat database. Main upregulated biological pathways were focal adhesion, metabolic pathway, MAPK pathway, and PPAR α signaling. Some genes involved in these pathways were actinin α 2 (ACTN2), collagen type IV (COL4A4), acyl-CoA synthetase (ACSL6), prostaglandin D2 synthase (PTGDS), cytochrome P450 (CYP2E1), PPAR α (PPARA), filamin C (FLNC), and transforming growth factor B3 (TGFB3). The main downregulated biological pathways were metabolic pathways, T cell receptor signaling, Type II diabetes mellitus, and pentose phosphate pathway. Some genes related with these pathways were pyruvate kinase (PKLR), phospholipase (PLD1), phosphofructokinase (PFKM), 3-hydroxyisobutyate dehydrogenase (HIBADH), phosphoinositide 3-kinase (PIK3R3), and protein kinase C (PRKCQ). Liver FA were analyzed by gas-liquid chromatography. Total FA concentration of liver tissue was 8.5 vs. 7.6 g FA/100 g tissue (DM basis, LLA vs. HLA, $P < 0.02$). Calves fed HLA-MR had greater ($P < 0.01$) liver concentrations (g/100 g FA) of LA (22.1 vs. 15.9), PUFA (43.1 vs. 35.5), and n-3 FA (5.1 vs. 4.2). Calves fed LLA-MR had greater ($P < 0.02$) concentrations (g/100 g FA) of SFA (45.1 vs. 40.0) and MUFA (16.3 vs. 14.3). Supplementing LA increased LA content of liver and altered the expression of key genes involved in different hepatic metabolic processes.

Key Words: calves, linoleic acid, gene expression

806 Use of tail skin temperature as a proxy for core body temperature in neonatal Holstein male calves. H. G. Bateman II* T. M. Hill, A. B. Chestnut, J. M. Aldrich, and R. L. Schlotterbeck, *Provimi North America, Brookville, OH.*

Our objective was to determine if tail skin temperatures could be used as a proxy for core body temperature in neonatal Holstein male calves to have continuous measurements of body temperature over multiple days. A total of 79 calves were used in 3 measurement periods (7+ d each). Thermocron (Maxim Integrated Products, Inc., Sunnyvale, CA) were attached to the underside of the tail immediately proximal to the observable vein using expandable tape (Vetrap, 3M, St. Paul, MN). These calves were then used to compare core body temperature (as measured via rectal temperature, M700 digital thermometer, GLA Agricultural Electronics, San Luis Obispo, CA) and measured tail skin temperatures. Rectal temperatures were manually measured and recorded along with the clock time and date. These were then matched to the recorded skin temperature closest in time from individual Thermocrons (continuous recording every 10 min) and those data used in mixed model regression analysis. The final data set used 1178 paired observations coded to indicate day of trial, calf, and time of day (AM or PM). The model used had fixed terms for recorded tail temperature and day of trial. Time of day, calf and period were included as random terms. Day of trial was found to be non-significant and removed from the model. All other terms remained significant at $P < 0.05$. The final model adjusted for calf, period, and time of day. Rectal temperature (°C) was best predicted as tail temperature (°C) * 0.4964 ± 0.02551 + 19.9177 ± 0.9869. This equation has an R^2 of 0.6120, variance inflation factor of 2.57, and RMSPE of 0.68°C. Tail skin temperature is related to rectal temperature in neonatal male calves and can be used as a noninvasive proxy for core body temperature.

Key Words: calves, model, temperature

807 Body temperature of neonatal male Holstein calves is partially influenced by ambient temperature in the calf nursery. H. G. Bateman II* T. M. Hill, A. B. Chestnut, J. M. Aldrich, W. Hu, and R. L. Schlotterbeck, *Provimi North America, Brookville, OH.*

Neonatal mammals have limited ability to regulate their body temperature. This ability improves as the animal ages. However, even adult mammals ability to thermoregulate is known to be influenced by the ambient conditions. An experiment was designed to determine the extent that ambient temperatures influenced body temperature in neonatal male Holstein calves housed in a non-temperature controlled calf nursery. A total of 78 calves were used in 3 measurement periods (7+ d each). Each calf had Thermocron (Maxim Integrated Products, Inc., Sunnyvale, CA) attached to the underside of the tail immediately proximal to the observable vein using expandable tape (Vetrap, 3M, St. Paul, MN). Calves were initially 2 d old and were monitored for 56 d. Ambient temperature was recorded using a Thermocron suspended inside the calf facility. Temperatures were recorded every 10 min and exhibited a circadian rhythm. All calves were housed in a single naturally ventilated barn with no added heat. Calves were housed in 1.2 × 2.4 m wire mesh stalls and bedded with straw. Calves were fed a common diet of milk replacer and ad libitum starter. Water was available at all times. Mixed model regressions were used to evaluate the relationship between ambient temperature and body temperature. Lag periods of 10 min from 0 to 120 min were calculated and used as potential regressors. Calf and trial were included in the model as random effects. Measurement time was modeled as a repeated term. Fixed terms were sequentially removed from the model until only significant terms remained and the variance inflation factor was less than 10 at which time the model was considered optimally parameterized. The accepted model included random terms of calf and trial in addition it includes terms for intercept, ambient temperature at the time of body temperature recording and ambient temperature 10, 20, 30, 40, 50, 100, and 120 min before body temperature reading. The model has log-likelihood R^2 of 0.32 and a variance inflation factor of 1.46. Body temperature in neonatal calves had a circadian rhythm and was partially related to ambient temperatures indicating that they may have troubles thermoregulating in periods of extreme temperature swings.

Key Words: calf, body temperature, ambient temperature

808 Jersey calf performance in response to high protein, high fat liquid feeds with varied fatty acid profiles. W. S. Bowen, V. A. Swank,* K. M. O'Diam, M. L. Eastridge, and K. M. Daniels, *Department of Animal Sciences, The Ohio State University, Columbus.*

Most commercially available milk replacers (MR) use edible lard as the main fat source; it contains primarily long-chain fatty acids (LCFA). However, 10.8% of fatty acids (FA) in Jersey whole milk are medium-chain fatty acids (MCFA). Coconut oil (CO) is a rich source of MCFA. The objective was to determine whether altering the FA profile of MR with varying amounts of CO, to more closely match the FA profile typically found in whole milk from Jersey cows, would improve Jersey calf growth. This randomized complete block design trial was conducted at Waterman Dairy (Columbus, OH) from November, 2010 through August, 2011. Male (n = 18) and female (n = 32) Jersey calves were randomly assigned at birth to 1 of 4 liquid diets: pasteurized Jersey saleable whole milk (pSWM; 27.9% CP, 33.5% fat, DM basis); MR containing 100% of fat as edible lard (100:00; 29.3% CP, 29.1% fat); MR containing 20% of fat as CO (80:20; 28.2% CP, 28.0% fat); MR containing 40% of fat as CO (60:40; 28.2% CP, 28.3% fat). Calves were fed 2L of their respective liquid diet twice daily from 2d of age until 7wk of age, and once daily until weaning (8wk of age). Calves had ad libitum access to starter and water. Calf BW was recorded at birth and once weekly for 9 wk. Feed intake and scour days (number of days with fecal score > 2) were recorded daily. Hip height (HH) and wither height (WH) were taken at birth, 4, 7, and 9 wk. Average daily gain, BW, WH, and HH did not differ by treatment. Calves fed pSWM had a higher milk DMI than calves fed 80:20 (0.523 vs. 0.498 kg/d). There was no effect of CO on milk DMI. Grain DMI and total DMI did not differ among treatments. Calves fed pSWM had an increase in days with a fecal score >2 compared with calves fed 80:20 (4.24 vs. 2.00 d). Coconut oil had a quadratic effect on fecal score, with calves fed 100:00, 80:20, and 60:40 scouring 4.00, 2.00, and 3.63 d, respectively. In conclusion, DMI and ADG were similar among treatments. Differences among treatments in fecal scores implicate possible benefits of MCFA inclusion on calf health, presumably due to their known antimicrobial properties.

Key Words: Jersey calf, milk replacer, fatty acids

809 Methods of reducing milk replacer to prepare dairy calves for weaning when large amounts of milk replacer have been fed. T. M. Hill,* H. G. Bateman II, J. M. Aldrich, and R. L. Schlotterbeck, *Nurture Research Center, Provimi North America, Brookville, OH.*

Numerous trials and labs have reported that calves fed large amounts of milk replacer (MR) and weaned over 7 d (or less) have reduced ADG from depressed starter intake, lessened rumen development, and reduced post-weaning digestion. At least 3 laboratories have implemented 21 to 25 d weaning periods that ameliorated the ADG and intake problems. We compared different gradual weaning programs to have calves fully weaned after 42 d on MR. Measurements were made for 56 d. Calves were 2 to 3 d old Holstein male calves (44 ± 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. A textured 20% CP starter and water were fed free-choice. Trials were completely randomized designs using repeated measures with means separated using pre-planned contrasts. In Trial 1, a 27% CP, 17% fat MR fed at 0.66 kg DM/d for 42 d (LOW) was compared with the same MR fed at 0.88 kg/d for 21 d and reduced to 0.66 kg/d in one step for 21 d (HIGH), or a 22% CP, 27% fat MR fed at 0.79 kg/d for 21 d and changed to the 27% CP, 17% fat MR fed at 0.66 kg/d for 21 d before weaning (HIFAT). Calves fed HIGH had greater ($P < 0.05$) ADG and similar starter intake compared with calves fed LOW, while calves fed HIFAT had lower ($P < 0.05$) starter intake and ADG compared with calves fed LOW. In Trial 2, the same 27% CP, 17% fat MR was fed at 0.66 kg DM/d for 42 d (LOW), fed at 0.96 kg/d for 21 d and reduced to 0.66 kg/d in one step for 21 d (HIGH), or fed at 0.96 kg/d for 28 d and gradually reduced compared with HIGH over 14 d before weaning (HIGRAD). Calves fed both HIGH and HIGRAD had greater ($P < 0.05$) ADG and similar starter intake to calves fed LOW. Weaning calves over 14 to 21 d that had been fed MR at 0.88 kg DM or more did not result in reductions in ADG and starter intake. Treatment HIGH tested in both trials and published previously is relatively simple to implement.

Key Words: feeding rate, milk replacer, weaning