Graduate Student Competition:
ADSA Production Division Oral Competition, MS Division

155   Effects of urea on uterine response to interferon-tau in presence of progesterone. J. Spencer*[1], K. Austin[2], K. Carnahan[1], and A. Ahmadzadeh[1], *[1]University of Idaho, Moscow, [2]University of Wyoming, Laramie.*

High blood and uterine urea concentrations, associated with high dietary protein, can reduce fertility in dairy cows. In an in vitro steroid free culture, urea did not affect bovine endometrial (BEND) cell expression of Mx1 and ISG15 in response to the ruminant maternal recognition protein (IFN-tau). However, uterine protein secretions are altered in response to IFN-tau in the presence of progesterone (P_4). Therefore, the objective of this study was to determine the direct effects of urea on protein expression of the endometrial cells of the bovine uteri in response to IFN-tau in the presence of P_4. Using BEND cells as a model, the effects of urea on the production of 2 IFN-tau stimulated proteins, ISG15 and Mx1, were examined. Bovine endometrial cells were grown to 80% confluency and further incubated for additional 24 h in culture media containing P_4 (10^{-7} M). Cells (90% confluent) were then treated with urea at final concentrations of 0, 5, 7.5, or 10 mM urea and subsequently, challenged with 0 or 10,000 antiviral units of recombinant IFN-tau and incubated for an additional 24 h. Once harvested, BEND cells were lysed and the cell supernatant was analyzed and quantified for Mx1 and ISG15, using SDS-PAGE, Western blot and immunoblotting protocols. Based on optical density, regardless of urea treatment, IFN-tau increased ($P < 0.01$) Mx1 and ISG15 by 11 and 4 fold, respectively. There was no effect of any urea treatment or urea by IFN-tau interaction on Mx1 and ISG15 production after 24 ($P = 0.9$) of culture. These results show that there is no disruption of IFN-tau stimulated Mx1 or ISG15 production, when BEND cells are exposed to varying concentrations of urea in the presence of P_4 in vitro.

Key Words: urea, interferon, bovine endometrial cells

156   Effect of bedding surface on the welfare of preweaned Jersey calves. C. A. Kurman* and P. D. Krawczel, *University of Tennessee, Knoxville.*

Previous research on the effect of the bedding surface on the welfare of dairy calves has produced mixed results with indication that calves prefer a soft, dry surface and others suggesting that bedding or flooring have no effect on behavior and performance. The objective of this study was to determine the effect on the behavior and performance of Jersey calves housed using individual hutches bedded with gravel, sand, or rubber mat. It was hypothesized that sand or rubber mat would increase lying time, decrease lying bouts, but not affect BW gain or feed intake in preweaned calves. Twenty-eight Jersey calves were blocked by birth date and randomly assigned to 1 of 3 bedding treatments (gravel, sand, or rubber mat). Lying time and lying bouts were assessed with dataloggers, recording at 1-min intervals for 3 consecutive days each week. Performance was determined by weight gain (calculated from birth weight and weekly BW) and grain intake (calculated as daily difference between grain offered and refused over 3-d). Data were collected for 8 wk following birth. Data were analyzed using a mixed model in SAS with repeated measures. Mean lying time (15.2 ± 0.3 h/d) was not affected by trt ($P = 0.51$), wk ($P = 0.16$), or trt × wk interactions ($P = 0.54$). Lying bouts were affected by trt ($P = 0.01$) and trt × wk interactions ($P = 0.05$) but not by wk ($P = 0.20$). Calves on mats engaged in more lying bouts/d (12.1 ± 0.7 n/d) than gravel (9.8 ± 1.0; $P = 0.01$) or sand (9.0 ± 0.7 n/d; $P < 0.001$). An effect of week was evident in BW gain (2.2 ± 0.2 kg/wk; $P = 0.002$), but trt ($P = 0.41$) or trt × wk interactions ($P = 0.19$) effects were not evident. Grain intake (gravel = 386.9 ± 59.8 g/d, mat = 413.3 ± 50.0 g/d, sand = 479.1 ± 52.7 g/d) increased from 0 g/d in wk 1 to 1095.8 g/d in wk 8 ($P < 0.001$) but there was no trt effect ($P = 0.48$) or trt × wk interaction ($P = 0.21$). There were no biological significant differences in behavior or performance among treatments. This suggests that, on a well-managed farm, any of these beddings may be used without compromising the welfare of preweaned Jersey calves.

Key Words: dairy calf, behavior, bedding

157   The effects of D-α-tocopherol and dietary energy on growth and health of dairy calves. L. A. Krueger*[1], K. Onda[1], M. Osman[1], M. R. O'Neil[1], R. L. Stuart[2], H. D. Tyler[1], B. Nonnecke[3,1], and D. C. Beitz[1], *[1]Department of Animal Science, Iowa State University, Ames, [2]Stuart Products Inc., Bedford, TX, [3]Ruminant Diseases and Immunology Research Unit, National Animal Disease Center, Agricultural Research Service, USDA, Ames, IA.*

To understand the effects of dietary vitamin E in relation to dietary energy on growth and immune status in dairy calves, 32 newborn Holstein bull calves were assigned to one of 4 treatments for 5 weeks in a 2 ×2 factorial randomized complete block, split plot design. Calves received one of 2 all-milk diets formulated to provide 70% or 100% of the dietary energy recommendation for milk-fed calves according to the NRC's Nutrient Requirements of Dairy Cattle. Calves in these 2 groups were either injected subcutaneously with 5 mL Vital E-A+D on d 1 and administered 200 IU vitamin E (Emcelle Tocopherol) orally via milk daily, or were not supplemented during the study period. Weight gain of calves receiving the 100% diet was greater than that of calves receiving the 70% diet. Calves receiving vitamin supplementation demonstrated elevated concentrations of plasma α-tocopherol, retinol, and 25-(OH)-vitamin D_3, but calves receiving the 100% diet demonstrated decreased concentration of plasma α-tocopherol. Serum haptoglobin, an acute phase protein, was higher at wk 2 for non-supplemented calves receiving the 100% diet. Serum amyloid A, also an acute phase protein, was not different among groups and was elevated from baseline during wk 1 through 3 before a return to baseline by wk 4. Plasma IgG_1 concentration was higher in vitamin-supplemented calves than in their non-supplemented dietary counterparts, while plasma IgG_2, IgA, and IgM concentrations were not different. In summary, dietary supplementation of vitamin E did not affect growth, but improved plasma α-tocopherol status, decreased serum haptoglobin associated with acute inflammation in calves fed the 100% diet, and slightly improved adaptive immune status. Consumption of the 100% diet increased weight gain in calves, but decreased plasma α-tocopherol and increased serum haptoglobin, indicating a role for vitamin E supplementation in prevention of inflammatory stimuli such as oxidative stress associated with accelerated growth and onset of infectious disease.

Key Words: tocopherol, haptoglobin, dairy calf

158 Metabolic and oxidant profiles of periparturient pastured dairy cows milked in an automatic milking system. M. F. Elischer*, J. M. Siegford, and E. L. Karcher, *Michigan State University, East Lansing.*

The periparturient period is a physiologically stressful time for dairy cows where an increase in energy expenditure paired with a decrease in feed intake leaves the cow highly susceptible to health issues, especially metabolic disorders and impaired immune function. Metabolic and oxidative status are related, though the precise linkage is unknown. Metabolic and oxidative stress profiles for cows in traditional milking and feeding are well documented, but little research has examined these health parameters in automatic milking systems (AMS) or with pasture-based diets. The objective of this study was to characterize metabolic and oxidative profiles for periparturient dairy cows milked in an AMS and consuming a pasture-based diet. Fourteen multiparous Friesian cows were sampled weekly from −21 to 21 d relative to calving. Eight primiparous cows were sampled weekly from calving to 21 d. Multiparous cows milked more frequently (2.60 milkings/d ± 0.24 vs. 1.93 ± 21; P kg/d ± 1.52 vs. 13.3 ± 1.37; P compared with primiparous cows. Blood was collected weekly and analyzed for nonesterified fatty acids (NEFA), β-hydroxybutyrate (BHBA), insulin, glucose, antioxidant potential (AOP), and reduced glutathione (GSH). NEFA concentrations declined from d 1 through 21 for both groups ($P < 0.05$). There was no significant effect of day or parity on BHBA concentrations. Insulin values did not differ significantly between the 2 groups. Glucose concentration was elevated on d 7 and 14 in primiparous compared with multiparous cows ($P < 0.05$). Primiparous cows had significantly higher AOP at 14 and 21 d postpartum, suggesting that primiparous cows had less oxidative stress as serum lipids were better protected. Lower concentrations of GSH, a major antioxidant, were exhibited in primiparous than multiparous cows, though this was not significant. Overall, blood analyses indicate primiparous cows experienced less metabolic and oxidative stress than multiparous cows, likely due to lower milk yield and frequency.

Key Words: oxidative stress, metabolism, robotic milking

159 Nutritional value and silage fermentation parameters of leaves and roots of yacón (*Smallanthus sonchifolius*) mixture as alternative supplementation of cattle in Colombia. L. Bernal*, *Universidad de La Salle, Bogotá, Colombia.*

In this study the nutritional value and fermentation parameters of silage leaves and roots of yacón (*Smallanthus sonchifolius*) was evaluated. Yacón is a native plant of the Andes. The leaves of yacón are not harvested for feeding ruminants. This forage does not compete with human food and has not been extensively studied in the country, in terms of animal nutrition. Samples were taken from the existing planting on the campus of La Salle University in Bogotá. Six treatments were evaluated with different inclusion rates of leaves and roots of yacón. T1: leaves 100%, T2: root 100%, T3: leaves 90: root 10; T4: leaves 80: root 20; T5: leaves 70: root 30 and T6: leaves 60: root 40. These mixtures were stored at ambient temperature in small plastic bags of around 1 kg fresh matter for a period of 56 d. At the end of the fermentation period, samples were taken for analysis of nutritional quality (dry matter DM, crude protein CP, neutral detergent fiber NDF, acid detergent fiber ADF and gross energy GE) and fermentation parameters (pH, ammonia nitrogen and its relation with total nitrogen). The experimental design was completely randomized, 6 treatments and 4 replicates. Variables were analyzed by the GLM procedure by SAS. There was a significant effect of the mixture ratio. The values of DM and CP were higher in leaves than in roots. The part of plant had a significant effect on values NDF, ADF and GE. The fermentation parameters were significantly different. The values of pH, ammonia nitrogen and the relationship between ammonia nitrogen/total nitrogen were better for mixed silages than for leaves and roots only. Finally, the result of nutritional value and silage fermentation parameter showed that it is better to use the mixture with up to 70% leaves, which is good option for feeding cattle.

Key Words: *Smallanthus sonchifolius*, roots, silage

160 Low cost on-farm predictors of individual cow risk for ketosis and fatty liver. Z. Sawall* and N. B. Litherland, *University of Minnesota, St. Paul.*

Early lactation data from 3 studies (n = 176 cows) were composited to determine on farm prediction tools for cows at risk for elevated serum BHBA and NEFA and liver triglycerides (TG). The objective of this retrospective analysis were to determine if low-cost, on-farm measures of colostrum yield (CY), colostrum specific gravity (CSG) and body condition score (BCS) at calving are good predictors of cow health and production in early lactation. Pearson correlation coefficients were calculated for CY, CSG, BCS, BHBA, NEFA and ME 305d milk production. CY is a significant predictor of serum BHBA on d 1 and d 7 postpartum. Serum NEFA can be predicted on d 1, 7 and 14 by CSG using Brix refractometer. Both CY and CSG are significantly correlated with liver TG on d 7 and CY and CSG help predict DMI during the first week postpartum. BCS is negatively correlated with serum calcium 24 h postpartum and can identify cows at risk for hypocalcaemia. BCS is positively correlated with serum BHBA at d 1 and d 14, serum NEFA at d 7 and d 14 and ME 305 d milk production. Low cost, on-farm measures of CY, CSG and BCS provides insight into rates of body reserve mobilization without blood or liver sample collection. The implementation of these tools together can allow dairy producers to quickly identify cows at risk for hypocalcaemia, ketosis, and low DMI shortly after parturition. Rapid, low cost identification of cows at high risk for these disorders allows for early treatment or implementation of tailored feeding and management strategies to minimize the incidence and severity of subclinical fresh cow disorders.

Table 1. Pearson correlations between colostrum yield (CY), colostrum specific gravity (CSG) and BCS on cow health parameters

	CY	CSG	BCS
Ca 12H	0.005	−0.14	−0.03
Ca 24 H	−0.06	−0.20	−0.31*
NEFA d 1	0.20*	0.17*	−0.04
NEFA d 7	0.11	0.29***	0.39**
NEFA d 14	0.03	0.20**	0.29*
BHBA d 1	0.19*	0.01	0.38**
BHBA d 7	0.16*	−0.02	0.13
BHBA d 14	0.02	−0.01	0.39**
Liver TG 7	0.20*	0.13**	0.23
Liver TG 14	0.15†	0.07	0.16
DMI wk 1	−0.18 *	0.32***	−0.16
ME 305-d milk	−0.08	0.08	0.29†

†$P < 0.1$, *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

Key Words: transition cow, cow health

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161   Mass loading of antibiotic resistance genes in feces of prophylactically treated dairy cattle. B. F. Willing*, L. R. Caudle, A. Pruden-Bagchi, and K. F. Knowlton, *Virginia Polytechnic Institute and State University, Blacksburg.*

Prophylactic antibiotic treatment has the potential to increase excretion of antibiotic resistance genes (ARGs) by dairy cattle through selection pressure on the gut microbiome. The objective of this study was to evaluate the effect of cephapirin on establishment and persistence of antibiotic resistance genes in dairy cattle during the dry period. To examine temporal variation in fecal excretion of ARGs, 32 end-of-lactation cows were used. Treatment cows (22) received cephapirin benzathine as an intramammary infusion before dry-off and control cows (10) received no antibiotics. Fecal grab samples were collected for each cow on d -2 or -3 (baseline, used as covariate), and d 1, 3, 5, 7, and once per week until d 56. Fecal samples were collected in sterile containers using a new glove for each cow, then freeze-dried. DNA was extracted from freeze-dried samples using a commercially available FastDNA SPIN KIT for Soil (MP Biomedical). The abundance of ARGs (Tet, Sul), integrase-specific gene (Int), and 16S rRNA were quantified using qPCR. Non-normal data were log-transformed and data were statistically analyzed using PROC GLIMMIX in SAS 9.2. There were significant interactions between treatment and day for all genes. In dry-treated cows, relative abundance (log gene copies/16S rRNA) of TetO, Sul1, and Int1 increased ($P < 0.0001$, $P < 0.001$, and $P < 0.0001$, respectively) from d 1 to d 56 following antibiotic treatment while relative abundance decreased ($P < 0.0001$, $P < 0.001$, and $P < 0.0001$, respectively) in untreated cows across the same time period. Relative abundance of TetW increased ($P < 0.0001$) during the dry period in both dry-treated and control cows. Administering long-acting antibiotics as intramammary dry therapy to dairy cows increases the selection pressure and subsequently increases the abundance and persistence of selected ARGs excreted during the dry period. Increased relative abundance of Int1 indicates increased potential of ARG dissemination by horizontal gene transfer.

Key Words: antibiotic resistance gene, cephapirin, prophylactic

162   Effect of oral administration of *Megasphaera elsdenii* on performance of Holstein cows during early lactation. K. D. Stevens*, M. L. Eastridge, S. K. Finney, and S. N. LeShure, *The Ohio State University, Columbus.*

Transition cows have a high risk for metabolic disease within the first 30 DIM. Administration of direct-fed microbials (DFM) may reduce the adverse effects that fresh cows experience during this transition period. *Megasphaera elsdenii* (*M. elsdenii*) is a lactic acid-utilizing bacterium that has shown promise as a potential DFM during the transition period. Primi- and multiparous Holstein cows (n = 162) at a commercial dairy herd in Ohio were assigned to 1 of 4 treatments: (1) control (no dose) (n = 44), (2) 200 mL Lactipro (*M. elsdenii*, 1×10^8 cfu/mL; MSBiotec, Littleton, CO) when cows entered (~-14 DIM) the close-up pen (n = 45), (3) 200 mL Lactipro at calving (n = 39), and 4) 200 mL Lactipro prepartum and 200 mL at calving (n = 34). Close-up cows were fed 71% forage (57:43 corn silage and wheat straw), and upon calving, cows entered the high group and were fed 41% forage (93:7 corn silage:wheat straw). All cows were body condition scored (BCS) prepartum and at 30, 60, and 90 DIM. Urine ketones (Ketostix; Bayer Corp., Leverkusen, Germany) were measured at 7 to 14 DIM. Cows were milked 3 times daily, and yield was recorded daily until 90 DIM using Afimilk (Kibbutz Afikim, Israel). Milk composition data were from monthly DHI (DHI Cooperative, Inc., Columbus, OH) samples taken from the first daily milking during the first 2 test dates postpartum. There was no differ-

ence in milk yield among treatments (39.8, 39.2, 39.7, and 40.3 ± 1.1 kg/d), and the test-day milk fat and protein percentages were similar among treatments. Test-day milk fat and protein were higher ($P < 0.001$) for the first (3.88%) versus second (3.38%) test-day, reflective of the low incidence of ketosis discussed below. Neither a difference in BCS by treatment nor a treatment by time interaction occurred. Based on urine ketones, only 2.5% of the cows in the study experienced clinical ketosis, but cows with ≥5 mg/dL were 31.8, 35.6, 25.6, and 17.6% for treatments, respectively. Concentrations of dietary starch and NDF fed both prepartum and postpartum may affect animal response to dosing with *M. elsdenii*.

Key Words: firect fed microbial, early lactation, *Megasphaera elsdenii*

163   Effect of heat stress in utero on calf performance and health through the first lactation. A. P. A. Monteiro*, S. Tao, I. M. Thompson, and G. E. Dahl, *University of Florida, Gainesville.*

Calves born to cows exposed to heat stress during the dry period have lower birth weight and weaning weight and compromised passive immune transfer compared with those born to dams that are cooled. However, it is unknown if heat stress in utero has carryover effects after weaning. The objective was to evaluate the effect of heat stress during late gestation on growth, fertility and milk production in the first lactation of the offspring. Data of animals obtained from previous experiments conducted during 5 consecutive summers were pooled and analyzed. Cows were dried off 46 d before expected calving and randomly assigned to either cooling (CL) or heat stress (HT). CL cows were housed under sprinklers, fans and shade, whereas only shade was provided to HT cows. Within 4 h after birth, 3.8 L of colostrum was fed to calves from both groups of cows. All calves were managed in the same manner and weaned at 49 d of age. Birth weight and survival of 147 calves (HT = 74; CL = 72) and body weight and growth rate from 72 heifers (HT = 34; CL = 38) were analyzed. Additionally, fertility and milk production in the first lactation from 38 heifers (HT = 17; CL = 21) were analyzed. As expected, HT calves were lighter (39.1 ± 0.7 vs. 44.8 ± 0.7 kg, $P < 0.01$) at birth than CL calves. CL heifers were heavier (200.2 ± 3.4 vs. 190.9 ± 3.7 kg, $P < 0.05$) up to one year old, but had similar weight gain (305.8 ± 5.9 vs. 299.1 ± 6.3 kg) compared with HT heifers. No differences in age at first AI or age at first parturition was observed, but HT heifers had a greater number of services per conception than CL heifers (2.6 ± 0.3 vs. 1.8 ± 0.3, $P = 0.03$). HT heifers tended to produce less milk up to 35 weeks of the first lactation compared with CL heifers (26.9 ± 1.9 vs. 29.3 ± 1.8 kg, $P = 0.11$), but no difference in body weight during lactation was observed (HT: 565.4 ± 12.0 kg; CL: 554.1 ± 11.0 kg). These data suggest that heat stress during the last 6 weeks of gestation negatively affects fertility and milk production up to and through the first lactation of offspring.

Key Words: calves, heat stress, postnatal performance

164   Association between dairy calf management practices and calf immune status. A. Bartier*, C. Windeyer, and L. Doepel, *University of Calgary, Calgary, Alberta, Canada.*

Dairy calves are at high risk of failure of passive transfer of immunity (FPT) if consumption of colostral IgG within hours of birth is inadequate. The objectives of this study were to determine (1) the incidence of FPT on Alberta dairy farms, (2) which neonatal calf management practices are used, and (3) the relationship between these practices and FPT. Fourteen commercial dairy farms were visited weekly from February to September, 2012. At each visit, blood samples were collected from

calves <7d old. Total serum protein (TSP) was determined with a refractometer and serum IgG was determined quantitatively by RID. Producers completed a survey for each calf outlining the management practices that were followed (e.g., amount of colostrum fed, time calf left with dam) in the first 7 d of life. A sample of first feeding colostrum was analyzed by RID for IgG content. A mixed linear models regression procedure was performed using TSP and serum IgG as response variables, management practices and colostrum IgG as predictor variables and 'farm' as a random effect. Data were obtained from 199 bull calves and 557 heifer calves. Minimum, maximum and mean ± SEM for TSP were 3.0, 10.0 and 5.39 ± 0.03 g/dL; for serum IgG, values were 0.35, 58.0 and 18.95 mg/ml. FPT was 44.7% based on TSP <5.2 g/dL and 27.7% based on IgG <10 mg/mL. Univariate analysis showed type of colostrum (e.g., pooled, dam) fed in the first 6 h and from 6 to 12 h of life, and amount of IgG consumed in the first 6 h of life to be significant predictors of serum IgG and TSP ($P < 0.0002$). Univariate analysis showed that type of milk (e.g., sale, waste) fed after colostrum, use of medications in the first week of life and if fresh or frozen colostrum was fed were significant only for serum IgG ($P < 0.03$); method of feeding in the first 6 h of life was significant only for TSP ($P < 0.003$). For the multivariate analysis all possible predictor variables were offered in the model and nonsignificant ($P > 0.05$) predictors were removed by backward elimination. IgG consumed in the first 6 h of life was the most important predictor variable ($P < 0.0001$) associated with both high serum IgG and TSP.

Key Words: IgG, calf management, FPT

165   Effects of acute feed restriction combined with targeted use of increasing LH in FSH preparations on superovulation and embryo quality in lactating dairy cows. R. W. Bender*, K. S. Hackbart, A. R. Dresch, P. D. Carvalho, L. M. Vieira, P. M. Crump, J. N. Guenther, R. D. Shaver, D. K. Combs, and M. C. Wiltbank, *University of Wisconsin-Madison, Madison.*

Superovulatory programs have multiple metabolic and hormonal factors that potentially affect success. This study evaluated the effect of acute feed restriction and increased luteinizing hormone (LH) content in the superovulatory preparation on superovulation response and embryo quality from lactating dairy cows. In each of 2 experiments, 16 lactating Holstein cows were superovulated in a Latin square design while exposed to a 2×2 factorial arrangement of treatments: feed restriction (FR; 25% reduction in DMI during 6 d before AI) vs. ad libitum (AL) feeding combined with high (H) vs. low (L) LH in the last 4 injections of the 8 injection superovulatory protocol. Embryos were flushed 7 d after AI. As expected, FR reduced circulating insulin concentrations ($P < 0.05$). Follicle numbers, ovulation rates, and corpora lutea on d 7 were not different. There was an interaction between FR and amount of LH on fertilization rates, percentage of structures that were Quality 1 and 2 embryos, and number of structures that were degenerate. In the first period analysis of experiments 1 and 2, fertilization rates were greater ($P < 0.01$) for the AL-L (89.4%) and FR-H (80.1%) treatments compared with the AL-H (47.9%) and FR-L (59.9%) treatments. Simi-

larly, the proportion of total structures designated as Quality 1 and 2 embryos was greater ($P < 0.01$) for AL-L (76.7%) and FR-H (73.4%) treatments compared with AL-H (35.6%) and FR-L (47.3%) treatments. In addition, the number of degenerate embryos was lower ($P = 0.03$) for AL-L (1.3) and FR-H (0.4) treatments than AL-H (2.6) and FR-L (2.3) treatments. Thus, cows with either too low (FR-L) or too high (AL-H) of insulin and LH stimulation have lower embryo production following superovulation due to reduced fertilization rate and increased percentage of degenerate embryos. The interaction of the gonadotropin content of the superovulatory preparation with the nutritional program of the donor cow needs to be considered to optimize superovulatory success.

Key Words: superovulation, feed restriction, LH

166   Description of weighing errors and times during preparation of a ration. Y. Trillo*[1], A. Lago[2], and N. Silva-del-Rio[1], [1]*Veterinary Medicine Teaching and Research Center, University of California Davis, Tulare, [2]DairyExperts, Tulare, CA.*

The objectives of this study were to describe weighing errors, time intervals between loading ingredients, length of ration preparation, and dropping times for the high cow ration prepared in 4 California dairies (A, B, C, and D) ranging in size from 2,500 to 6,000 cows. Records from Jan to Dec 2012 were extracted from the feeding management software FeedWatch 7.0. The variables included were: date, drop number, recipe, ingredient, feeder, loading sequence, loading start-time, loading end-time, loading errors, dropping start-time, dropping end-time, and dropping sequence. Descriptive statistics were conducted with SAS 9.3. The high cow ration included 13 (A), 14 (B), 18 (C) and 12 (D) ingredients. All dairies had a main feeder and one (A), 2 (D) or 3 (B, C) relief feeders. The main feeder prepared 85% (n = 3,319), 64% (n = 2,547), 64% (n = 1,162) and, 83% (n = 1,949) of the high cow ration loads in dairy A, B, C and D respectively. The frequency in which ingredients were loaded with errors $\geq |2|$% of the expected weight was 35.9% (A), 67.6% (B), 46.4% (C), and 44.0% (D) for the main feeders and 33% (A), 66% (B), 46% (C), and 48% (D) for the relief feeders. The frequency in which ingredients were loaded with errors $\leq |0.5|$% of the expected weight was 22% (A), 8% (B), 13% (C), and 21% (D) for the main feeders and 22% (A), 9% (B), 15% (C), and 19% (D) for the relief feeders. Short intervals between loading of ingredients (<45 s) might indicate that the feeder was wrongly dropping leftovers from the previous ingredient in the next ingredient load. Intervals between loading of ingredients <45 s occurred in 12% (A), 14% (B), 1% (C) and 36% (D) of the loads done by the main feeder and in 7% (A), 16% (B), 1% (C) and 27% (D) of the loads done by the relief feeder(s). The first drop of the day had an interquartile range (Q0.25 – Q0.75) of 10 (C), 14 (A, B), and 20 (D) min whereas for the last drop of the day was 9 (D), 24 (C), 52 (A) and 54 (B) min. Feeding management software could be used to identify opportunities to improve the feeding process. Future research should define achievable goals on feeding management practices for dairies.

Key Words: dairy cow, feeding management, software

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