W19 Effect of housing on the leukocyte transcriptome of beef calves. Robmay Garcia*, Dianelys Gonzalez-Pena, and Sandra L. Rodriguez-Zas, *University of Illinois at Urbana-Champaign, Urbana IL.*

Movement of beef calves from a pasture to a housing environment induces a stress response including changes in leukocyte physiology. Understanding the molecular profiles underlying these changes can help to develop better management practices and treatments to minimize the deleterious effects of stress. The objective of this study is to characterize the leukocytes transcriptome changes during housing stress after moving claves from outdoor to indoor environments. Transcriptome of blood leukocytes from 6 beef calves in outdoor pasture (d 0) was compared with that of d 1, 2 and 7 after being moved indoors. Individual calf RNA-seq libraries were sequenced using Illumina HiSeq analyzer platform. Single-end reads were mapped to the *Bos taurus* reference genome (UCSC_bosTau7) using Tophat v2.0.12. In total, 26,163 isoform transcripts pertaining to 8,606 genes were identified and 1,636 isoform transcripts pertaining to 1,320 genes were differentially expressed at d 1, d 2 and d 7 relative to d 0 (False Discovery Rate-adjusted P-value <0.05) using Cufflinks v2.2.1. The number of differentially expressed genes increased with time indoors: d 0 vs d 1 (32 genes), d 0 vs d 2 (434 genes), and d 0 vs d 7 (1170 genes). Among the top 50 differentially abundant transcripts CCAAT/enhancer binding protein C/EBP epsilon (CEBPE) and Dual Specificity Phosphatase 1 (DUSP1) were overexpressed in leukocytes collected on d 1, d 2, and d 7, relative to d 0. DUSP1 plays a role in the cellular response to environmental stress, and CEBPE is essential for terminal differentiation and functional maturation of leukocyte cells. Functional analysis of the differentially expressed genes using DAVID identified 8 enriched functional category clusters pertaining to Biological Processes, Molecular functions and KEGG Pathways (Enrichment score >2): protein synthesis and transport, cell regulation and reorganization, RNA transport, leukocyte activation, proliferation and differentiation. These categories confirm that housing stress elicits changes in the leukocyte transcriptome associated with inflammatory response. The permanency of these changes and the impact on inflammatory response to other stress sources including infection and management requires further evaluation.

Key Words: transcriptome, stress, leukocyte

W20 Short-term α-tocopherol treatment during neonatal period modulates pro-inflammatory response to endotoxin (LPS) challenge in the same calves several months later. S. Kahl* and T. H. Elsasser, *USDA, ARS, Animal Biosciences and Biotechnology Laboratory, Beltsville, MD.*

Vitamin E, a major natural antioxidant, has been previously shown to attenuate pro-inflammatory response to immune challenge in cattle. Our objective was to evaluate the effect of short-term treatment with α-tocopherol in newborn calves on selected elements of the pro-inflammatory response to LPS challenge in the same calves ~8 mo later. In 2 separate trials (T_1, T_2), newborn Angus × Hereford calves (T1, n = 41; T2, n = 17) were assigned to α-tocopherol (E, 1000 IU/d, ~1 g, i.m.) or control (C, placebo, canola oil, ~1 g) treatments. Injections of E/placebo (21/20, 8/9, in T_1 and T_2, respectively) started on the day of birth and were repeated every other day for the first 14 d of life. At the age of 237 ± 3 d (BW 276 ± 5 kg) all calves were challenged with 2 consecutive LPS injections (LPS1, LPS2) 4 d apart (0.25 µg *E. coli* 055:B5/kg BW, i.v.). Blood samples were obtained at 0, 1, 2, 3, 4, and 24 h relative to each LPS injection. In T_1, plasma concentration of tumor necrosis factor-α (TNF-α) was determined by RIA with TNF-α response to LPS calculated as area under the time × concentration curve (AUC). In T_2, plasma total antioxidative capacity (TAC), xanthine oxidase activity (XO), as well as concentration of acute phase proteins, haptoglobin (Hg) and serum amyloid-A (SAA), were measured. No differences between treatment groups were found after LPS1 and LPS2 in plasma XO and Hg, and after LPS1 in TNF-α and SAA responses. However, compared with C, E treatment decreased plasma TNF-α AUC (5.9 vs. 9.3 ng/mL × h, $P < 0.05$) and increased SAA concentration (246 vs.151 µg/mL, $P < 0.01$) after LPS2. Plasma TAC declined 4 d after LPS1 in all calves (116 vs. 168 µmol/L, $P < 0.01$) although the overall values during LPS2 were greater in E than C calves (125 vs. 106 µmol/L, $P < 0.05$). The data suggest that the i.m. treatment of calves with E during a critical first 14 d of life may serve to condition the animals toward a modified immune response later in life. Weather this implies a potential to alter the development of the immune system to improved life-long health remains to be determined.

Key Words: beef calves, endotoxin, α-tocopherol

W21 Influence of a feed additive on support of calves during initial growth phase. Jorge A. Saltijeral Oaxaca[1], Luis Galicia[1], Juan E. Guerra[2], and H. I. Rogge*[3], *[1]Universidad Autónoma Metropolitana, Mexico, DF, Mexico, [2]Universidad Autónoma de Sinaloa, Culiacan, Sinaloa Mexico, [3]Phytobiotics Futterzusatzstoffe GmbH, Eltville, Germany.*

The objective of this study was to analyze the effect of Sangrovit CS, plant-derived quaternary benzophenanthridine and protopine alkaloids (QBA+PA) on growth performance and health status of calves. A total of 160 Holstein Friesians calves obtained from 2 commercial farms of Tizayuca/Mexico were randomly assigned into 2 groups: a) control, b) Treatment (control + 5 g/meal of QBA+PA product added into the milk replacer (MR) from the 3rd until the 23rd day of life). Calves were fed twice daily 2 L of MR/meal and concentrate and alfalfa ad libitum. Colostrum, MR, bacteriological and parasitic fecal analysis were conducted. The coproparasitoscopic analyses were performed on 3 and 23 d of age of each calf. In the treatment group no antibiotic of any kind was used, whereas in control the routine farm protocols including antibiotic treatments (ATB) were conducted. The following management factors that influence the health status of the calves were considered: birth management, colostrum and feeding management, housing and hygiene of the calves. Overall, morbidity and mortality rates were 21.8% and 5.66%, respectively, both below the national benchmark parameters, with no significant differences among the groups. In the control group, 2 calves died from diarrhea whereas in the treatment no deaths were observed. The average duration of diarrhea tended to be lower in the treatment group with 2.4 d vs. 3.2 d in the control group (SD 1.25; $P = 0.07$). Parasitized calves were lower in treatment group ($P < 0.01$; Table 1). The starting weight was 38.83 kg (±SD 6.12 kg). Weight gain during the trial was 5.596 and 4.045 kg for treatment and control groups respectively ($P = 0.07$). The QBA+PA had a positive influence on the well-being and weight gain of the calves. Furthermore, it supported to remedy intestinal disorders leading to lower persistence of diarrhea and no death due to diarrhea.

Table 1 (Abstr. W21). The most common pathogens found in feces

Species	Control	Experimental
Entamoeba spp.	21	17
Eimeria spp.	3	0
Cyptosporidium parvum	0	1
Giardia spp.	1	0
Bacillus spp.	6	3
Escherichia coli	6	6

Key Words: calves, feed additive

W22 Influence of sex and temperament on response to *Salmonella* Newport extract vaccine in crossbred beef calves. Anita M. Snell*[1,2], Jason P. Banta[2], Brittini P. Littlejohn[1,2], Sara D. Lawhon[3], Tom H. Welsh Jr.[1], Ron D. Randel[2], and Rhonda C. Vann[4], *[1]Department of Animal Science, Texas A&M, College Station, TX, [2]AgriLife Research and Extension Center, Texas A&M, Overton, TX, [3]Department of Veterinary Pathobiology, Texas A&M, College Station, TX, [4]MAFES-E.G. Morrison Brown Loam Exp. Station, Mississippi State University, , Raymond, MS.*

The effect of sex and temperament on response of crossbred beef calves to a commercially available *Salmonella* vaccine was studied. Exit velocity (m/s) and pen score (1 = calm and 5 = excitable) data collected from calves 28 d before weaning were used for assignment to 1 of 3 temperament classes (calm, n = 31; intermediate, n = 44; temperamental, n = 31). Calves, stratified by temperament class and sex, were assigned to non-vaccinated (control, n = 54) and vaccinated (n = 52) groups. Vaccinated calves received 2 mL of *Salmonella* Newport extract vaccine (Zoetis, Florham Park, NJ) twice: at weaning (d 0) and 28 d after weaning. Body weights were recorded on d 0, 28, and 56 and blood samples were taken at 7-d intervals to determine serum cortisol concentration by RIA and Ig ratio specific to the vaccine by ELISA (Epitopix, MN). Weight and age data were analyzed with mixed model procedures of SAS; sex, temperament class, and vaccine group were included as fixed effects. Average age at weaning did not differ between treatments (P = 0.2; 200 ± 3.9 d). Vaccination did not affect weight gain from d 0 to 28 (P = 0.33; 7.21 ± 0.9 kg) or d 0 to 56 (P = 0.4; 24.61 ± 1.1 kg). As there was no difference in performance due to vaccination only vaccinated calves were used in the remaining analysis. A specific Ig profile of each calf was assessed for maximum height for both initial (Ig1; d 0 to 21) and booster vaccination (Ig2; d 28 to 56). Neither sex (P > 0.19) nor temperament (P > 0.07) influenced peak Ig1 (0.34 ± 0.06), peak Ig1d (15 ± 1.5 d), peak Ig2 (0.70 ± 0.03), or peak Ig2d (41 ± 2.7 d). Cortisol and Ig ratio during the study were analyzed as repeated measures; the models included temperament, sex, and day as fixed effects. Temperament did not affect average cortisol (P = 0.29) or average Ig ratio (P = 0.50). Male relative to female calves had lower average cortisol (P < 0.01; 31.5 ± 2.8 vs 55.7 ± 2.8 ng/mL) and greater average Ig ratios (P = 0.04; 0.44 ± 0.03 vs 0.34 ± 0.03). Sex of calf influenced the adaptive immune response to *Salmonella* Newport extract vaccine.

Key Words: *Salmonella*, cortisol, calves

W23 Passive transfer of immunity in dairy heifer calves on Costa Rican dairy farms. J. A. Elizondo-Salazar*[1], D. Benavides-Varela[2], A. Vargas-Ramírez[1], and C. M. Campos-Granados[3], *[1]Estación Experimental Alfredo Volio Mata, Facultad de Ciencias Agroalimentarias, Universidad de Costa Rica, San José, Costa Rica, [2]Alimentos del Norte S.A-DIPCR, Costa Rica, [3]Centro de Investigación en Nutrición Animal, Facultad de Ciencias Agroalimentarias, Universidad de Costa Rica, San José, Costa Rica.*

The objective of this study was to determine the transfer of passive immunity of dairy heifer calves in 4 provinces of Costa Rica. The data presented correspond to total serum protein (TSP) measurements obtained in 50 dairy farms. A total of 2500 heifer calves were sampled. Dam breeds were classified into Holstein, Jersey, Holstein × Jersey and other. Blood samples were collected between d 1 and 7 of age into serum Vacutainer tubes, refrigerated overnight, centrifuged, and the serum separated from clot within 24 h of collection. A hand-held refractometer was used to measure TSP. For the purpose of this study, failure of passive immunity was considered when TSP concentration was less than 5.5 g/dL. GLM procedure was used to establish differences between parity and breed of the dams. Descriptive statistics were generated to define percentage of failure of passive transfer by breed and parity of the dam. TSP concentration ranged from 2.0 to 10.0, with an overall mean of 5.9 g/dL. Of all the calves evaluated, 38.8% presented failure of passive transfer of immunity. Calves born to Jersey and Holstein × Jersey crosses had significantly (P < 0.05) higher TSP concentrations than calves born to Holstein and other breeds. When considering parity of the dam, there were no significant differences (P > 0.05) on TSP concentration; however, offspring born to first lactation heifers showed the lowest percentage of animals with inadequate transfer of immunity. Calves that were allowed to suckle their dams showed a 44% failure of passive immunity against 33% of calves that were given colostrum by bottle. The findings of this study suggest that minimizing the risk of calves with failure of passive transfer of immunity is an important task to perform in dairy herds of Costa Rica.

Table 1 (Abstr. W23). Effect of dam breed over total serum protein (TSP) concentration in 2500 heifer calves from 1 to 7 days old in 50 dairy farms located in four provinces of Costa Rica[1]

Dam breed	n	TSP, g/dL	Animals with FPTI, %
Holstein	769	5.8 ± 0.06[b]	39[b]
Holstein × Jersey	287	6.4 ± 0.09[a]	25[a]
Jersey	743	6.3 ± 0.07[a]	27[a]
Other	740	5.4 ± 0.07[c]	55[c]

[1]n = number of animals; FPTI = failure of passive transfer of immunity.

Key Words: total serum protein, colostrum, passive immunity

W24 Prevalence of bovine respiratory disease in pre-weaned dairy calves in Northern California. Betsy M. Karle*[1], Sasha A. Dubrovsky[2], William J. Love[3], Deniece R. Williams[3], Jeffery W. Stackhouse[4], Randall J. Anderson[5], Alison L. Van Eenennaam[2], Terry W. Lehenbauer[3,5], and Sharif S. Aly[3,5], *[1]University of California Cooperative Extension, Orland, CA, [2]University of California Department of Animal Science, Davis, CA, [3]UC Davis Veterinary Medicine Teaching and Research Center, Tulare, CA, [4]University of California Cooperative Extension, Eureka, CA, [5]California Department of Food and Agriculture, Animal Health Branch, Sacramento, CA, [6]Department of Population Health and Reproduction, School of Veterinary Medicine, University of California, Davis, Davis, CA.*

Bovine respiratory disease (BRD) is one of the most important diseases affecting the health of dairy calves. The objective of this cross-sectional study was to estimate the prevalence of BRD in pre-weaned dairy calves and identify management practices that may be risk factors for BRD. A total of 31 dairies in 3 regions in Northern California were surveyed by convenience sample. Represented counties included Humboldt and

Del Norte (Region 1, average herd size 788, n = 10), Sonoma, Marin and Mendocino (Region 2, average herd size 305, n = 11), and Glenn, Tehama and Yuba (Region 3, average herd size 1,010, n = 10). A comprehensive questionnaire focusing on calf management practices and relevant demographic information was administered via in-person interviews at each dairy. Calves currently raised on each dairy were randomly sampled and evaluated using the California BRD scoring system. A total of 1,438 calves were evaluated, and mean BRD prevalence was 10.2% (95% CI 8.7, 11.6), which did not differ significantly across regions ($P = 0.67$; 10.7% Region 1, 8.9% Region 2 and 12.5% Region 3). Overall BRD prevalence was 10.5% on organic dairies and 10.8% on conventional dairies ($P = 0.93$). Herd size, volume of colostrum fed within 12 h of birth, testing colostrum for IgG concentration or age that calves were moved to group pens were not significantly associated with BRD prevalence at the herd level. Additionally, age, sex, and airborne ammonia concentrations within 1 foot of the hutch or housing floor were not significantly associated with BRD in calves. Group housing of pre-weaned calves was common in Northern California, with pens containing between 2 to 40 calves, and significantly increased the odds of BRD (OR 1.07, $P < 0.001$). Additionally, the prevalence of BRD in Jersey calves was 2.2 times higher than in Holstein calves ($P < 0.001$). Respiratory disease clearly affects calves throughout Northern California. While factors affecting the prevalence of BRD are apparent, further research is needed to identify additional management practices that affect prevalence of respiratory disease in pre-weaned dairy calves.

Key Words: BRD, preweaned calves, scoring system

W25 Risk factors for diarrhea and pneumonia in Holstein calves offered colostrum of different quality in a hot environment. Edir Torres-Rodriguez*[1], Miguel A. Mellado-Bosque[2], Jose E. Garcia-Martinez[2], and Francisco G. Veliz-Deras[1], *[1]Universidad Autonoma Agraria Antonio Narro, Torreon, Coahuila, Mexico, [2]Universidad Autonoma Agraria Antonio Narro, Saltillo, Coahuila, Mexico.*

Intake of non-contaminated and high immunoglobulin content colostrum by neonatal calves is an important factor in successful calf programs. The objectives of this study were to determine the risk factors for the occurrence of diarrhea and pneumonia by evaluating colostrum quality (Ig content determined with colostrometer and refractometry) and bacterial contamination in 300 Holstein calves born in June 2014. A second objective was to describe the effect of feeding colostrum of different quality on growth and physiological parameters in neonatal calves. Calves were removed from their dams shortly after parturition and fed 2.8 L of colostrum by bottle; calves were placed in individual portable roofed pens. Colostrum variables were total bacterial counts, coliform bacteria counts, refractometry values, and Ig content. Multivariable logistic-regression analyses were performed. None of the variables included in the model affected the occurrence of diarrhea. The calves with highest odds of pneumonia were those receiving colostrum with total standard plate counts >15,000/mL (odds ratio = 1.8). Calves fed colostrum with < 15,000 counts/mL (n = 145) had greater weaning weights (66.3 kg ± 6.7 vs. 63.4 kg ± 6.7; $P < 0.01$) and preweaning daily weight gain (0.515 kg/d ± 116 vs. 0.477 kg/d ± 123; $P < 0.01$) than calves fed colostrum with >15,000 counts/mL (n = 155). Calves fed colostrum with the highest bacterial counts presented higher ($P < 0.01$) values for fecal consistency (1.5 ± 0.8) than calves receiving colostrum with low bacterial counts (1.2 ± 0.5; scale 1 to 4, with 1 being normal feces to 4 being severe diarrhea; $P < 0.01$). Calves receiving colostrum with higher Ig content (>85 mg/mL, measured with colostrometer) presented feces more solid ($P < 0.01$) than calves receiving colostrum with Ig < 85 mg/mL (1.2 ± 0.6 vs 1.5 ± 0.9). There was no difference between groups when examining the effect of different characteristics of colostrum on height to withers, respiration condition and rectal temperature. Given the conditions of this trial, feeding colostrum with <15,000 total bacterial counts/ml reduced the odds of pneumonia and enhanced growth rate of Holstein calves in a hot environment.

Key Words: colostrum, total standard plate count, calves

W26 Preweaning plane of nutrition and *Mannheimia haemolytica* dose influence metabolic responses to a combined bovine herpesvirus-1 and *Mannheimia haemolytica* challenge in post-weaned Holstein calves. K. P. Sharon*[1,2], Y. L. Liang[1], N. C. Burdick Sanchez[2], J. A. Carroll[2], P. R. Broadway[2], and M. A. Ballou[1], *[1]Texas Tech University, Department of Animal and Food Sciences, Lubbock, TX, [2]USDA-ARS, Livestock Issues Research Unit, Lubbock, TX.*

To determine whether previous plane of milk replacer nutrition (PON) and *M. haemolytica* (MH) dose influences metabolic responses to a combined viral-bacterial respiratory challenge, Holstein calves (1d of age; n = 30) were assigned to treatments in a 2 × 3 factorial with preweaned PON and dose of MH as main effects (n = 5/treatment). Calves were fed either a low (LPN; n = 15) or a high PON (HPN; n = 15) from birth through weaning. Calves fed the LPN were fed 445g DM/d of milk replacer until weaning, and HPN calves were fed 830g DM/d of milk replacer from 1 to 10d and 1080g from 11d until weaning. Calf starter and water were offered ad libitum. Calves were step-down weaned beginning at 54d and moved into an enclosed barn at 70d. Indwelling jugular catheters were inserted at 80d. Calves were challenged with 1.5×10^8 PFU/mL/nostril of bovine herpesvirus-1 (BHV-1) at 81d and with 10^6, 10^7, or 10^8 cfu of MH at 84d. Blood samples were collected at varying intervals respective to BHV-1 and MH challenges. Body weights at 70d were different ($P < 0.01$) between LPN and HPN calves (62.2 vs 81.2 ± 2.67 kg, respectively). Although HPN calves consumed more calf starter ($P < 0.01$) during the challenge, there were no differences ($P \geq 0.42$) in ADG or when intake was expressed per kg $BW^{0.75}$. Glucose concentrations were greater ($P \leq 0.02$) in HPN compared with LPN calves during both BHV-1 (61.1 vs 57.5 ± 1.01 mg/dL, respectively) and MH challenges (57.8 vs 53.5 ± 1.13 mg/dL, respectively). Following the MH challenge, calves receiving 10^8 MH had the greatest ($P = 0.05$) NEFA concentrations. During the BHV-1 challenge, there was a time × PON interaction ($P = 0.02$) for plasma urea N concentrations, where LPN calves had greater ($P = 0.02$) concentrations at 72 h. Glucose concentrations were reduced among LPN calves throughout the respiratory challenge, and calves receiving 10^8 MH mobilized more lipid reserves after the MH challenge suggesting calves fed a LPN during preweaning and calves receiving a 10^8 MH dose results in a more severe response to a viral-bacterial respiratory challenge.

Key Words: health, nutrition, respiratory

W27 Effect of repeated intravenous LPS infusions in endometrium gene expression and inflammatory response in Holstein heifers. Artur C. C. Fernandes*[1,2], Juliana S. Souza[1], Douglas Veira[1], Audrey Nadalin[1], Lúcio E. H. Melo[2], and Ronaldo L. A. Cerri[1], *[1]Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC, Canada, [2]Federal Rural University of Pernambuco, Recife, Pernambuco, Brazil.*

This study aimed to evaluate the effect of repeated intravenous lipopolysaccharide (LPS) stimulus in endometrial gene expression of candidate

transcripts of nonlactating heifers on late luteal phase. Heifers (n = 22; 11 mo of age) were synchronized by the ovsynch protocol and enrolled into control group (CON; n = 11) that received sterile saline solution i.v., or LPS group (LPS; n = 11) submitted to repeated LPS injections i.v. (0.1; 0.25; 0.5; 0.75; 1.0; 1.25 µg/kg WB) starting 2 d (d) after AI (d0), then every other d. At each injection, rectal temperatures were measured during 6 h. Blood samples were collected from the d-1 to d13, for analyses of TNF-α, haptoglobin, progesterone, and WBC count and differential. On d15, endometrium tissue biopsies were taken and kept at −80°C until qRT-PCR analysis of 30 target genes related to immune system, adhesion molecules and endometrium receptivity. Data were checked for normality and analyzed by ANOVA for repeated measures using proc MIXED and UNIVARIATE. After each injection, temperature was greater in the first 6h in the LPS compared with CON group ($P < 0.05$). Both TNF-α ($P = 0.05$) and haptoglobin ($P < 0.01$) were increased in the LPS group with significant ($P < 0.05$) treatment by d interactions. Total leukocyte count was not different between treatments ($P = 0.29$), but differential count was increased for neutrophils, band cells and monocytes, but decreased for lymphocytes and eosinophil in LPS compared with CON group ($P < 0.01$). Progesterone concentrations during the experimental period were not different between treatments. Out of the 30 target genes analyzed, only 3 transcripts were differentially expressed. IDO ($P = 0.04$; Fold = 0.48) and PTX3 ($P = 0.01$; Fold = 0.38) were downregulated, whereas MX1 ($P = 0.02$; Fold = 2.85) was upregulated in the LPS group. Sequential LPS injections was able to induce a systemic pro-inflammatory state with limited, but strong effect in gene expression of transcripts related to the immune system, suggesting a possible explanation for sub-fertility related to health disorders in dairy cows.

Key Words: gene expression, heifer, LPS

W28 Performance of Jersey calves born from dams treated with recombinant bovine somatotropin during the periparturient period. Paula R. B. Silva*[1], Henrique F. Soares[1], Gabriel D. Bombardelli[1], and Ricardo C. Chebel[1,2], *[1]University of Minnesota, St Paul, MN, [2]University of Florida, Gainesville, FL.*

Objectives of the current experiment were to evaluate the performance of Jersey calves born from Jersey dams treated with recombinant bovine somatotropin (rbST) during the periparturient period. Jersey dams were assigned randomly to control (n = 264) and rbST (125 mg of rbST every 7 d from −21 to 21 d relative to calving; n = 258) treatments. A sub-sample (control = 19, rbST = 19) of cows had colostrum samples collected at calving to determine IgG concentration. Male Jersey calves were sold at birth, leaving 199 and 173 calves from control and rbST cows. Calves born from cows enrolled in this experiment were fed pooled colostrum (4 L) twice within 6 h of birth, were housed in individual hutches from birth to 21 d of age, and in group pens with automated calf feeders from 22 d of age to weaning (60 d of age). Calves were weighed individually at birth (control = 198, rbST = 172) and at weaning (control = 122, rbST = 107) and average daily gain in the first 60 d of life was calculated. Calves were observed daily for diagnosis of diarrhea and respiratory illness. Data referent to health and performance to 60 d of age is reported herein. Continuous data were analyzed by ANOVA and dichotomous data were analyzed by logistic regression. Colostrum IgG concentration was not different between treatments (control = 87.6 ± 6.4, rbST = 94.5 ± 6.4 g/L; $P = 0.45$). Treatment did not affect birth weight (control = 27.9 ± 0.4, rbST = 27.4 ± 0.5 kg; $P = 0.24$), weaning weight (control = 70.5 ± 1.8, rbST = 71.1 ± 1.8 kg; $P = 0.60$) or average daily gain (control = 0.74 ± 0.03, rbST = 0.74 ± 0.03 kg/d; $P = 0.88$). There was a greater likelihood of calves born from rbST cows to be diagnosed with diarrhea (control = 1.0, rbST = 4.6%; $P = 0.05$) but treatment did not affect the likelihood of pneumonia (control = 25.6, rbST = 27.8%; $P = 0.61$) and death (control = 10.6, rbST = 13.3%; $P = 0.41$) within the first 60 d of life. Treatment of periparturient Jersey cows with small doses of rbST did not affect performance and health of calves up to 60 d of life.

Key Words: recombinant bovine somatotropin, Jersey calves, performance

W29 Supplementation of *Saccharomyces cerevisiae* fermentation products for the prevention of geophagia in Holstein female calves fed milk in buckets. Sonia Vazquez-Flores*[1], Stephany Barrera-Almanza[1], María de Jesús Guerrero[2], Kristy Dorton[3], Mark Scott[3], and William Sanchez[3], *[1]Tecnológico de Monterrey, Querétaro, Querétaro, México, [2]Universidad Autónoma de Querétaro, Querétaro, Querétaro, México, [3]Diamond V, Cedar Rapids, IA.*

The objective of the study was to compare 2 nutritional complements delivered in feed to diminish geophagia in neonatal calves with or without concurrent gastrointestinal diseases. Ruminal acidosis has been extensively studied in adult ruminants, and neglected in neonatal calves. Under certain feeding systems like bucket feeding milk, a common practice in most dairies in Mexico; it becomes the main factor for nutritional behavioral changes. Sand eating (geophagia) leads to tympanism, bruxism, depression, enterotoxemia, and sudden deaths. 60 Holstein female calves were randomly assigned at birth to 1 of 3 treatments: maltodextrin (C); BIOMOS (T1); and Smartcare/XPC (T2). Treatments were delivered in colostrum and in both whole UV purified milk and calf starter for up to 60 d in the morning feeding. Urine, blood and fecal samples (6, 2 and 8 respectively) were collected from each calf during the neonatal period. Analysis for bacteriological, parasitological and pH determination were performed. Binomial and repeated measures were determined by Welch ANOVA test, Duncan's test for multiple comparisons, Bartlett and Logistic Fit, nonparametric tests and odds ratio. Urine pH showed a range from 5 to 9, stratification was made taking 3 parameters from Oetzel, 2003: acid pH (5–6.9); neutral pH (7–7.9) and alkaline pH (8–9). See Table 1 for results. A statistical correlation was found with least squares means analysis for geophagia cases and days in diarrhea for the C group. No differences were found in diarrhea and *E. coli*, *Salmonella* spp., *Campylobacter* spp. and *Cryptosporidium* spp. with Tukey-Kramer test. Supplementation of T2 to neonatal calves' diet allowed the neonate to control best the metabolic acidity, being twice as often the need for buffers in the C group.

Table 1 (Abstr. W29).

Treatment group	Acid urine pH (5-6.9)	Geophagia mean (SD)	Odds ratio (95% CI) for no geophagia cases
C	61.7% (74)	0.23 (0.44)	
T1	73.3% (88)	0.2 (0.41)	vs. control: 0.54 (0.15–1.9)[a]
			vs. control: 0.12 (0.028–0.53)[a]
T2	72.5% (87)	0.1 (0.31)[b]	vs. T1: 0.25 (0.04–0.97)[b]

[a]Significant difference (P-value = 0.05); [b]highly significant difference (P-value = 0.006).

Key Words: neonatal, calves, acidosis

W30 Comparison of the effect of LongRange (eprinomectin) versus Dectomax (doramectin) and fly tags on growth of post-weaned grazing dairy heifers. M. W. Sahar[1,2], J. E. Tower[1], T. S. Dennis[1], A. M. Mosiman[1], H. F. P. Schmitz[1], R. K. Tessman[3], and T.

D. Nennich*[1,4], [1]*Purdue University, West Lafayette, IN,* [2]*Kabul University, Kabul, Afghanistan,* [3]*Merial, Hallsville, MO,* [4]*Famo Feeds, Freeport, MN.*

Limited information is available on gain and structural growth of young grazing dairy heifers when treated with different parasiticides. The objective of this study was to compare the effects of LongRange (eprinomectin) (LGR) against Dectomax (doramectin) and pyrethroid impregnated fly tags (DFT) on gain, structural growth, and fecal egg counts (FEC) of grazing, post-weaned Holstein dairy heifers. Forty-eight heifers were randomly grouped into 12 paddocks according to BW (169.5 ± 8.5 Kg of BW and 149.8 ± 13.8 d of age) and assigned to 1 of 2 treatments: 1) LGR or 2) DFT. The BW, hip height (HH), withers height (WH), hip width (HW), body condition score (BCS), heart girth (HG), blood samples, and fecal samples were collected every 4 wk from June until August 2014. Face flies (FF) and horn flies (HF) were counted twice/wk. Water consumption for each paddock was recorded 2 times/wk. Temperature and relative humidity were recorded hourly. Data were analyzed using PROC MIXED in SAS as repeated records using pen within treatment as a random variable. Daily midday temperatures (1200 to 1500 h) averaged 26.9 ± 0.14°C during the study. The ADG did not differ between treatments (mean ADG = 0.92(0.02) Kg/d; P = 0.79) with BW at the end of the study averaging 210.2 and 208.9(1.02) Kg (P = 0.38) for LGR and DFT, respectively. The HH and WH (P = 0.61) averaged 117.4(0.29) and 112.3(0.39) cm, respectively, at the end of the study. The HG (P = 0.38), HW (P = 0.34), and BCS (P = 0.86) were also similar between treatments. However, PUN values tended to be greater (P = 0.06) for LGR compared with DFT (12.7 and 11.4(0.28) mg/dL, respectively). Water intakes averaged 18.8 L/d for DFT and 20.1(2.07) L/d for LGR (P = 0.67). Fecal egg counts were lower (P = 0.02) for heifers treated with LGR compared with DFT (95.2 and 246.7(60.7) epg, respectively) and HF counts tended (P = 0.08) to be lower for DFT than LGR (9.7 and 17.2(0.08) flies/heifer, respectively) with no differences in FF counts (P = 0.24). Treating post-weaned grazing Holstein dairy heifers with either LGR or DFT resulted in similar growth performance; however, LGR reduced FEC and DFT reduced the presence of horn flies.

Key Words: doramectin, dairy heifer, eprinomectin

W31 Associations between fecal pathogens, growth, and clinical signs of diarrhea in dairy heifer calves. Elizabeth S. Binversie*, Melissa C. Cornett, Catie C. Cramer, and Amy L. Stanton, *University of Wisconsin-Madison, Department of Dairy Science, Madison, WI.*

Diarrhea can affect the health, performance, and welfare of preweaned dairy calves. The objectives for this project were to determine (1) associations between a positive test for a fecal pathogen and the probability of a calf showing clinical signs of diarrhea and (2) the impact of number of positive fecal tests on calf growth. The study population included dairy heifer calves (n = 54) on a commercial dairy that were enrolled in a 2 × 2 factorial study design examining a direct fed microbial and 2 milk programs. Feces were collected weekly for the first 4 weeks of life and tested for presence of 4 fecal pathogens: Rotavirus (ROT), Coronavirus (COR), *E. coli* K99 (F5) (ECO) and *Cryptosporidium* (CRP) (Enterichek). Clinical diarrhea was identified using a standardized fecal score that combined observations of odor, consistency, fluidity and color. Calves were weighed at birth (BW) and 5 weeks of age (WT5). The association between pathogen and diarrhea was evaluated with a logistic regression model (PROC GLIMMIX, SAS) with calf as a random effect and an autoregressive covariance structure. The association between weight at 5 weeks and number of positive fecal tests was evaluated using a linear regression model (Proc Mixed), controlling for initial weight and calf age. At 2 weeks of age calves were 5.8 times [95% CL: 2.2 to 15.3] as likely to test positive for at least one fecal pathogen compared with 4 (P < 0.001). Controlling for age, calves that tested positive for CRP were 2.8 times [95% CL: 1.2 to 6.4] as likely to show clinical signs of diarrhea (P < 0.05). Rotavirus and ECO were not associated with clinical signs of diarrhea. *E. coli*, CRP, and COR were not significantly associated with WT5. Rotavirus was associated with WT5 (P < 0.05). Calves with ROT at 1 or 2 time points weighed 5.1 ± 1.9 kg (LSM ± SEM) and 5.3 ± 1.9 kg (LSM ± SEM) less than calves that never tested positive, respectively (P < 0.001). In conclusion, although considered to be associated with a single diarrheal complex, specific pathogens may have different effects on growth, and knowledge of pathogens present may provide greater insight into treatment and management of calves with diarrhea.

Key Words: calves, growth, diarrhea

W32 Efficacy of feeding First Day Formula CR versus maternal colostrum on calf serum immunological parameters. Alfonso Lago*[1], Claudia Leonardi[1], Cedric Blanc[2], David Cook[3], Michael Socha[4], and Humberto Rivera[5], [1]*DairyExperts Inc., Tulare, CA,* [2]*Pacific Rim Dairy, Corcoran, CA,* [3]*Milk Products Inc., Chilton, WI,* [4]*Zinpro Corporation, Eden Prairie, MN,* [5]*Accelerated Genetics, Baraboo, WI.*

Commercially available colostrum replacers (CR) are commonly used for convenience, when maternal colostrum (MC) is unavailable, of questionable quality or in disease control programs. The objective was to determine the efficacy of a colostrum-derived CR, First Day Formula CR (Accelerated Genetics, Baraboo, WI), versus raw MC on immunological parameters. A total of 1,220 female and male Jersey and crossbred calves born in a California Central Valley dairy were systematically assigned to either CR or MC based on birth order. Calves assigned to CR were tube fed the CR product, reconstituted with 1.9 L of water and calves assigned to MC were tube fed 2.8 L of MC at 1 h ± 5 min after the calf was born. Every sixth calf born between 1:00 to 7:00 and 9:00 to 15:00 h that was enrolled was weighed and bled before first feeding and all calves born during those time intervals were bled at 22 to 28 h after birth. Immunoglobulin G (IgG) concentration was determined in serum samples using a radial immunodiffusion kit (Triple J Farms, Bellingham, WA). IgG was also measured in MC fed to every sixth calf born during the previously mentioned time intervals. The CR provided ~150 g IgG per dose and MC contained an average of 63.6 mg/mL of IgG. Outcome variables included serum IgG at 22 to 28 h after birth (n = 592), failure of passive transfer (FPT) defined as serum IgG < 10 mg/ml (n = 592), and apparent efficiency of absorption (AEA) (n = 96), calculated as grams of IgG absorbed into blood circulation. Only one calf in each treatment group (CR and MC) experienced FPT. The mean serum concentration of IgG was 19.8 mg/mL for calves fed CR and 23.4 for MC (P < 0.05). However, AEA of IgG did not differ between treatments and was 34.4% for CR and 35.9% for MC (P = 0.52). Therefore, the slightly higher mean blood concentration of IgG for calves fed MC was due mainly to a higher IgG intake. Overall, IgG absorption and serum concentration of calves were within acceptable ranges when fed either CR or MC. In this study the parameters measured indicated that the CR used was comparable to MC in eliciting passive transfer.

Key Words: calves, colostrum, immunoglobulin

W33 Relationship between serum total proteins and immunoglobulin G for calves fed either First Day Formula CR or maternal colostrum. Alfonso Lago*[1], Claudia Leonardi[1], Cedric Blanc[2],

David Cook[3], Michael Socha[4], and Humberto Rivera[5], *[1]DairyExperts Inc., Tulare, CA, [2]Pacific Rim Dairy, Corcoran, CA, [3]Milk Products Inc., Chilton, WI, [4]Zinpro Corporation, Eden Prairie, MN, [5]Accelerated Genetics, Baraboo, WI.*

Total serum proteins concentration (TP) is frequently measured in calves to evaluate adequacy of passive transfer of immunoglobulin G (IgG) from colostrum. However, calves fed some commercially available colostrum-derived colostrum replacers (CR) may have lower serum TP at equal IgG concentrations than calves fed maternal colostrum (MC). This can be due to removal of some proteins during manufacturing of CR. The objective was to determine the linear relationship between TP and IgG for CR and MC. Serum IgG and TP measurements from blood collected at 22 to 28 h after birth were available from 299 calves fed CR (First Day Formula CR, Accelerated Genetics, Baraboo, WI) and 292 calves fed MC. Concentration of IgG was determined using a radial immunodiffusion kit (Triple J Farms, Bellingham, WA) and TP using a digital refractometer (Misco, Model DD-2, Solon, OH). The linear relationship between TP and IgG was investigated for MC and CR using the Reg procedure of SAS (SAS Institute Inc., Cary, NC). The following are the linear relationships between IgG and TP in serum for the CR [IgG mg/mL = −9.87(±1.88) + 5.77(±0.36) × TP g/dL] and MC [IgG mg/mL = −45.30(±2.58) + 12.45(±0.44) × TP g/dL]. For both CR and MC, a linear relationship between TP and IgG was observed ($P <$ 0.01). However, for CR, a smaller percentage of the variability in IgG was accounted by TP ($R^2 = 0.465$ for CR and $R^2 = 0.738$ for MC). The TP value that resulted in IgG equal to 10 mg/mL (90% CI) was 3.44 g/dL (2.48, 4.38) for CR and 4.44 g/dL (3.65, 5.23) for MC. The 90% CI for MC includes the classical reference value of 5.2 g/dL indicating that the value estimated in the present study is not significantly different from the classical reference. Only one calf fed CR and one calf fed MC had a serum IgG value less than 10 mg/mL, making the estimation of the TP cut point for failure of passive transfer potentially inaccurate. In conclusion, lower serum TP values at equal IgG concentrations were found when feeding CR compared with MC. Therefore, a lower TP cut point indicative of successful passive transfer of IgG should be used when using CR.

Key Words: calves, replacer, total protein

W34 Prophylactic efficacy of an engineered biotherapeutic fusion protein against *Cryptosporidium parvum* in experimentally challenged neonatal calves. Travis J. De Wolfe*[1], Sheila M. McGuirk[1], Nicholas S. Keuler[1], Robert D. Bremel[2], Jane Homan[2], Michael Imboden[2], Deborah A. Schaefer[3], and Benjamin J. Darien[1], *[1]University of Wisconsin-Madison, Madison, WI, [2]ioGenetics, Inc., Madison, WI, [3]University of Arizona, Tucson, AZ.*

Cryptosporidium parvum is a parasitic pathogen that causes gastroenteritis in cattle and humans. The host innate immune response to *C. parvum* infection is associated with expression of enteric antimicrobial peptides that may represent a useful prophylactic to prevent *C. parvum* infection. The aim of this study is to evaluate a model of *C. parvum* infection and to evaluate the prophylactic efficacy of a *C. parvum*-specific monoclonal antibody, 4H9, fused to the human cathelicidin LL-37 (4H9-G1-LL37) in *C. parvum* challenged calves. Holstein bull calves (n = 18) were randomly assigned to receive either 0 mg (control), 20 mg, or 100 mg of fusion protein 4H9-G1-LL37 orally upon birth. Approximately 36–44 h later, calves were challenged with 1×10^7 *C. parvum* oocysts. Fecal consistency, daily total fecal volumes, daily oocyst concentration (oocysts/mL), and total daily oocysts shed were assessed over a 10-d post-challenge period. Prior to experimental *C. parvum* challenge all calves tested negative for *C. parvum* and by d 3 post-challenge all calves were shedding *C. parvum* oocysts in feces and had developed diarrhea. The control calves exhibited features of a natural infection, with diarrhea occurring between 4 and 7d post-challenge. The daily oocyst concentration was determined by immunofluorescence microscopy. Enumeration of total daily oocysts shed, was calculated as the product of the oocyst concentration and the total fecal volume collected for the corresponding day. The daily oocyst concentration was highly correlated with total daily oocysts shed for d 2–10 in the control calves, validating both quantification methods as robust measures of shedding even during peak oocyst production. Prophylactic treatment (20 mg) of calves before challenge tended to reduce total oocyte shedding on d 6 compared with control calves ($P = 0.085$). These results validated the oocyst quantification technique and demonstrate the potential efficacy of the prophylactic fusion protein 4H9-G1-LL37 in reducing *C. parvum* shedding. These results also suggest that additional studies with a larger sample size are warranted.

Key Words: *Cryptosporidium parvum*, cathelicidin, fusion protein

W35 Association between plasma haptoglobin concentration and bovine respiratory disease status in preweaned dairy calves. Sonia J. Moisá*[1], Sharif S. Aly[2], William J. Love[2], Terry W. Lehenbauer[2], Alison L. Van Eenennaam[3], and Lindsey E. Hulbert[1], *[1]Department of Animal Sciences and Industry, Kansas State University, Manhattan, KS, [2]School of Veterinary Medicine, University of California-Davis, ,Tulare, CA, [3]Department of Animal Sciences, University of California-Davis, Davis, CA.*

The objective of this case-control study was to assess the association between bovine respiratory disease score, determined by a scoring system (BRDs), and plasma Haptoglobin concentration (Hp). Four dairy operations located in the central San Joaquin Valley of California participated in this study (A, B, C, D) during the months of April to September, 2013. At each location, heifer or bull dairy calves were identified using as treatments BRDs-positive (n = 150); and randomly chosen calves within the same age group, sex, and breed (Jersey or Holstein) served as controls (Con; n = 356). Whole blood was collected, and plasma Hp concentrations were measured using a colorimetric method base on peroxidase activity. In addition, each calf had a respiratory examination via thoracic auscultation (Au) and Ultrasound (Us). Haptoglobin data were analyzed using the MIXED procedure of SAS using age as a covariate with BRDs as the fixed effect in the statistical model with breed, sex, Au, Us, or location analyzed separately. Some Con calves had abnormal Au (n = 22; 15%) and some of the BRDs calves had normal Au (n = 113; 32%). Preliminary results showed that BRDs-positive calves with abnormal Au and Us tended to have higher Hp ($P = 0.10$ and $P =$ 0.13 respectively). Location accounted for variation in Hp ($P = 0.01$); Control calves at D had greater concentrations of Hp than Con calves at the other locations. In addition, BRDs-positive calves at A had lower Hp than BRDs-positive calves at the other locations. Further investigation is needed to determine if Hp can serve as a biological marker for respiratory disease in BRDs-positive or negative calves with abnormal Au and Us. Also, baseline concentrations for haptoglobin may need to be established for specific locations.

Key Words: bovine respiratory disease, haptoglobin, preweaned dairy calves

W36 Cosinor analysis of CRT in heifers. Alexander W. Altman*[1], Nicole C. Burdick-Sanchez[2], Jeffery A. Carroll[2], Ty B. Schmidt[3], Kyle R. McLeod[1], Glen E. Aiken[4], and Eric S. Vanzant[1],

[1]Department of Animal and Food Sciences, University of Kentucky, Lexington, KY, [2]Livestock Issues Research Unit, USDA-ARS, Lubbock, TX, [3]Department of Animal Science, University of Nebraska-Lincoln, Lincoln, NE, [4]Forage Animal Production Research Unit, USDA-ARS, Lexington, KY.

Cosinor analysis can detect changes in phase, amplitude, or means of circadian rhythm of body temperature (CRT). Two experiments (E1: 22 Angus heifers, 292 ± 9 kg BW; E2: 16 Angus and 8 Hereford × Angus heifers, 335 ± 11 kg BW) evaluated changes to CRT due to a minor, chronic stressor (endophyte) and a major, acute stressor (LPS). Diets, starting 10 d before LPS challenge and fed at 1.8 × NE_m in individual stalls (3.0 × 3.7 m), contained 20% of either endophyte-free (E-) or endophyte-infected (E+) fescue seed, 30% cottonseed hulls, 36% cracked corn, and 14% supplement and were balanced to meet protein and mineral requirements. E2 included MGA (0.5 mg/hd/d) and evaluation of weaning exit velocity (wEV).Vaginal (E1 and E2) and rectal (E2 only) temperature probes recorded body temperature every 5 min. Cosinor analysis was used to analyze data in each of 4 phases: pre-treatment diet (P1), treatment diet, pre-LPS (P2), post-LPS temperature spike 1 (P3), post-LPS temperature spike 2 (P4). Disruption to CRT occurred during P2 of both experiments, as evidenced by 39% of curves failing to fit a cosine model (i.e., less than 40% R^2) compared with only 5% of curves failing to meet inclusion criteria for all other phases, suggesting that abrupt dietary shifts can affect temperature regulation. Amplitude differences across days ($P = 0.05$) occurred in P1 of E1, when mean temperatures did not differ ($P > 0.10$). Amplitude ($P = 0.80$) and mean temperature ($P = 0.66$) between treatment groups in P3 of E1 were similar, but shifts in timing of the peak ($P = 0.09$) occurred. Endophyte affected vaginal temperature amplitudes in P2 ($P = 0.07$) and P4 ($P = 0.08$) of E2 without influencing mean temperatures. Shifts in timing of peak vaginal temperatures during P1 ($P = 0.01$) of E2 across days may indicate adaptation of CRT to shifts in environment. Treatment × wEV interactions were significant for mean rectal, but not vaginal, temperatures during P1 ($P = 0.10$), P2 ($P = 0.10$), and P3 ($P = 0.04$) of E2, indicating different temperature responses between sites. These data demonstrate that cosinor analysis can be used to detect shifts in CRT responses that would not be detected by evaluation of mean temperature responses alone.

Key Words: endophyte, LPS, CRT

W37 Effect of bovine genotype on heifer response to repeated lipopolysaccharide (LPS) administration. Georgina Cousillas*[1], Aimee Benjamin[2], Wanda J. Weber[1], David Kerr[2], Theodore H. Elsasser[3], Stanislaw Kahl[3], and Brian A. Crooker[1], *[1]University of Minnesota, St. Paul, MN, [2]University of Vermont, Burlington, VT, [3]USDA-ARS, Beltsville, MD.*

Heifers (n = 4/genotype) from unselected (stable milk yield since 1964, UH) and contemporary (CH) Holsteins that differed in milk yield (6,200 and 11,100 kg milk/305 d) or from Red Angus cows (RA) were fed the same diet ad lib and housed together for 47 d before being challenged with 0.5 µg LPS/kg BW. Heifers were 20 mo old and pregnant except for 2 CH heifers that were synchronized to be at d 8 of their cycle at the first LPS challenge (C1). Progesterone exceeded 3.5 ng/mL at C1. Jugular catheters were implanted 24 h before LPS (*Escherichia coli* O111:B4). Blood samples were collected at −1, −0.5, 0, 1, 2, 3, 4, 6, 8, and 24 h relative to LPS administration and plasma harvested. Body temperatures (BT) were determined at these times and at 5 and 7 h. A second identical LPS challenge (C2) was administered 4 d later. Data were analyzed by repeated measures using PROC MIXED (SAS). Means differed when $P < 0.05$. Cortisol, interleukin-6 (IL-6), xanthine oxidase (XO), and tumor necrosis factor α (TNFα) were greater ($P < 0.01$) in C1 than C2, BT and IGF-1 were less ($P < 0.01$) and glucose and nitric oxide (NOX) did not differ ($P > 0.11$) between C1 and C2. There were genotype x challenge x time interactions ($P < 0.05$) for BT, glucose and TNFα. During C1, BT increased earlier and peaked higher in RA than UH or CH, glucose increased less in RA than UH or CH, and TNFα increased more in CH than UH and RA. Glucose, TNFα, and BT did not differ ($P > 0.10$) among genotypes during C2. There was an interaction of genotype and challenge for IL-6 as response in UH was greater than in CH or RA in C1 but there was no effect of genotype on IL-6 in C2. There was a trend for NOX ($P = 0.10$) to be less in RA than in UH or CH and a trend ($P = 0.10$) for a genotype × challenge interaction for XO as XO was greater in UH than in CH and RA in C1 but not in C2. Results indicate the reduced response during a repeated challenge decreases the ability to detect an effect of genotype on LPS. Regardless, results indicate genotype affects bovine response to LPS and that the effect of genotype differs among the response variables assessed in this study.

Key Words: innate immunity, bovine genotype, lipopolysaccharide

W38 The effects of plane of milk replacer nutrition on the health and performance of high-risk Holstein bull calves from a commercial calf ranch. K. P. Sharon*[1,3], L. E. Hulbert[2], J. A. Carroll[3], and M. A. Ballou[1], *[1]Department of Animal and Food Sciences, Texas Tech University, Lubbock, TX, [2]Department of Animal Sciences and Industry, Kansas State University, Manhattan, KS , [3]Livestock Issues Research Unit, USDA-ARS, Lubbock, TX.*

To determine if preweaning plane of milk replacer nutrition (PON) influences health and performance of high risk Holstein bull calves, 36 Holstein bull calves (1d of age) from a commercial calf ranch were assigned to either a high (HPN; n = 18; 20% and 28% DM lipid and protein) or a low plane of milk replacer nutrition (LPN; n = 18; 20% DM lipid and protein) through weaning. Total serum protein concentrations confirmed that 72 and 76% of calves had failure of passive transfer (<5.2g/dL) in HPN and LPN, respectively. All calves were bottle fed twice daily, the LPN were fed 445 g DM/d of milk replacer until weaning, and the HPN calves were fed 830 g DM/d of milk replacer during the first 10 d and 1080 g from 11 d until weaning. Calf starter and water were offered ad libitum. Calves were step-down weaned beginning at 51 d and ending on 57 d. Data are reported as HPN vs. LPN throughout, respectively. Two of the 18 calves died in both treatments. There was a tendency ($P = 0.100$) for more HPN calves to bloat during the study (29.4 vs 6.7%). The HPN calves had greater ($P = 0.007$) incidence of scouring (66.7 vs. 22.2%), but there was no difference ($P = 0.688$) in the percentage of calves that received systemic antibiotics (47 vs. 40%). There was a time × PON interaction ($P < 0.001$) in weekly starter intake, where LPN ate more ($P \leq 0.004$) starter during wk 6, 7, 8, and 9. There was a time × PON interaction ($P = 0.017$) in water intake, where LPN had greater ($P \leq 0.001$) water intake throughout the study (3.6 vs. 2.3 ± 0.21L). There was a time × PON interaction ($P < 0.001$) in ADG, whereas HPN had greater ($P \leq 0.001$) ADG from 0 to 25 d (0.53 vs. 0.08 ± 0.040kg/d), 0 to 49 d (0.60 vs. 0.23 ± 0.040kg/d), and 0 to 68 d (0.58 vs. 0.33 ± 0.049kg/d). There was also a time × PON interaction ($P < 0.001$) in F:G, whereas HPN had greater ($P \leq 0.054$) efficiency from 0 to 25 d (1.7 vs. 5.8 ± 0.38), 0 to 49 d (1.8 vs. 3.7 ± 0.38), and 0 to 68 d (2.2 vs. 3.3 ± 0.38). Risk for bloat and scouring were greater for calves fed the HPN, but there was no difference in antibiotic treatment or mortality. Further, the HPN calves had greater performance over the preweaning period.

Key Words: calf, health, nutrition

W39 The effect of diarrhea, fever, and respiratory disease on post-weaning weight of Holstein dairy heifers in an automated feeding system. Gabriela A. Zaldumbide*, Melissa C. Cornett, and Amy L. Stanton, *University of Wisconsin-Madison, Madison, WI.*

Automated feeder systems (AFS) are gaining popularity in the dairy industry. Considering that calves intermingle in this system, it is important to evaluate and understand the risk of diseases and their impact on calf weight. This study examined the effect of cumulative health events (HE), respiratory disease (BRD), fever (F), and diarrhea (D), on 1-wk post-weaning weight (FWT) in calves. Holstein heifers (n = 96) from a 2 × 2 factorial study were used for this trial. Factorials were direct-fed microbial (DFM) efficacy and 2 pasteurized milk feeding plans that offered 543 L over 53 feeder days (FD). Plan 1 offered (7L/d) and peaked at 28 FD (13L/d). Plan 2 offered (11L/d) and peaked at 21 FD (15L/d). Both plans weaned calves at 53 FD. Researchers conducted complete health exams twice weekly from birth until FWT. Calves were weighed at 3 ± 2 d (Mean ± SD) of age and at FWT 66 ± 3 d. The effect of HE on FWT was evaluated by PROC MIXED in SAS, controlling for initial weight, age, and milk plan with study month as a random effect. The HE of calves were categorized into a score of 0, 1, 2, or 3 based on number of HE for each of the following: F, BRD, and D. A score of 0 indicated no HE, a score of 1 was 2–3 HE, a score of 2 was 4–5 HE, and a score of 3 was 6+ HE. For F, D, and BRD 22%, 20.8%, 19.8% of calves had a score of 0, respectively. For F, 52.1%, 18.8%, and 7.2% were categorized as 1, 2, and 3, respectively. For D, 53.1%, 24.0%, and 2.1% of calves scored 1, 2 and 3, respectively. For BRD 41.7%, 29.1%, and 9.4% of calves scored 1, 2, and 3, respectively. Final post weaning weight was 93.6 ± 12.9 kg (LSM ± SEM). Initial weight and final age were significantly associated with FWT ($P < 0.0001$), ($P < 0.0001$), respectively. For every increase in D HE score, FWT were lowered by −1.54 ± 0.62 kg ($P < 0.02$). For every additional F HE, FWT was lowered −1.05 ± 0.50 kg ($P < 0.04$). Final weight was not influenced by BRD ($P = 0.54$). Results suggest that diarrhea and fever have a cumulative effect on growth in dairy calves reared in AFS.