Effects of a *Bacillus*-based direct-fed microbial on high- and low-health calf herds. S. R. Fensterscheier1, R. P. Arias1, C. M. Peter1, D. Haag1, A. M. Lange1, and E. A. Galbraith, 1United Animal Health Inc, Sheridan, IN, 2Microbial Discovery Group, Franklin, WI.

Our objectives were to evaluate the effects of a *Bacillus*-based direct-fed microbial designed for calves (DFM, 1.84 × 10^7 cfu/h/d, United Animal Health, Sheridan, IN) in commercial dairy herds with historical records of high- (<3% mortality; < 3% scours) and low-health (>5% mortality; > 5% scours). In Exp. 1, newborn calves received 1 gallon of colostrum within 2 h after birth and were transferred to the calf barn. On d 5, calves were moved to group pens where they remained until weaning (d60). Calves received whole milk with (DFM, n = 104) or without any supplement (Control, n = 115) through an automatic calf feeding system (H&L 100, Hold & Lau, Germany). Daily milk intake (DMI) and BWs were recorded individually by the Calf Guide software. Medical cases and treatments (health events) were recorded for each calf and analyzed using PROC GLIMMIX with the main effect of treatment and random effect of pen. Average daily gain (ADG), weight gain (WG) and DMI were analyzed using PROC MIXED of SAS with treatment × pen as main effects. ADG (0.62 ± 0.02 vs. 0.45 ± 0.02 kg) and WG from birth to weaning (36.9 ± 1.24 vs. 27.1 ± 1.24 kg) were higher (P < 0.0001) in calves that received DFM compared with Control calves, respectively. DMI and health events did not differ (P > 0.05) between treatments. In Exp. 2, newborn calves received colostrum and were transferred to individual hutches. Calves received milk replacer 28/10 with (DFM, n = 236) or without any supplement (Control, n = 212) until weaning (60–90 d old). Health events were recorded individually for each calf and were analyzed using PROC GLIMMIX with the main effect of treatment, and calf ID as random effect. Supplementation of the DFM from birth to weaning resulted in a 10.3% decrease (P = 0.0494) in health events (DFM 44.9% vs. Control 55.2%). Digestive (scours with or without blood and constipation) cases (P = 0.0639) and percent of treated calves (P = 0.1443) tended to decrease with the supplementation of the DFM (33.5% vs. 42.9%, and 44.5% vs. 51.9% for DFM vs. Control, respectively). Supplementation of a *Bacillus*-based DFM to calves from birth to weaning increased performance and decreased health events.

Key Words: direct-fed microbial (DFM), calf, performance

Feeding *Saccharomyces cerevisiae* fermentation products modulates immune function and reduces the severity of bovine respiratory syncytial virus infection in preweaned calves. A. Mahmoud1, J. Slate1, S. Hong1, I. Yoon1, and J. McGill1, 1Iowa State University, Department of Veterinary Microbiology and Preventive Medicine, Ames, IA, 2Veterinary Quarantine of Alexandria, General Organization for Veterinary Services, Ministry of Agriculture and Land Reclamation, Alexandria, Egypt, 3Diamond V, Cedar Rapids, IA.

Bovine respiratory disease (BRD) is a leading cause of mortality in preweaned dairy calves and weaned dairy heifers. Given increasing concerns related to the development of antimicrobial resistance, there is interest in identifying alternative strategies which can be used to reduce the impact of BRD. The objective of this study was to determine the effects of oral supplementation with *Saccharomyces cerevisiae* fermentation products (SCFP; SmartCare and NutriTek; Diamond V) on the outcome of bovine respiratory syncytial virus (BRSV) infection in preweaned dairy calves. Twenty-four, 1–2-d old calves were assigned 2 groups (12/group): 1) control, base milk replacer and calf starter; or 2) SCFP treated, milk replacer with 1 g/d SmartCare and calf starter top-dressed with 5 g/d NutriTek. Calves were challenged with ~10^6 (Median Tissue Culture Infectious Dose, TCID₅₀) BRSV on d 21. Calves were monitored for clinical signs. Nasal swabs were collected to monitor virus shedding. Peripheral blood and bronchoalveolar lavage (BAL) samples were collected for immunologic analyses. Calves were euthanized on d 10 post infection to evaluate gross lung pathology and pathogen load in the lung tissue. Following BRSV infection, calves receiving SCFP had significantly reduced clinical disease scores compared with controls (P = 0.030); reduced airway neutrophil recruitment (P = 0.002) and reduced lung pathology (P = 0.031). Calves receiving SCFP shed less virus than control calves (P = 0.028) and tended toward lower viral loads in the lungs (P = 0.051). Immune cells from the peripheral blood of SCFP treated calves produced increased (P < 0.05) quantities of IL-6 and TNFα in response to toll-like receptor stimulation; while cells from the BAL secreted less (P < 0.05) proinflammatory cytokines in response to the same stimuli. Results from this study suggest that supplementing with SCFP modulates both systemic and mucosal immune responses and may improve the outcome of an acute respiratory viral infection in preweaned dairy calves.

Key Words: *Saccharomyces cerevisiae* fermentation products, bovine respiratory disease, innate immunity


On farm machine leukocyte differential cell counts (DCC) that can be acquired quickly may be useful to augment calf risk identification protocols at the time of arrival at a veal or dairy beef operation. The objective of this study was to assess the utility of DCC taken at the time of arrival at a grain-fed veal facility and 72 h post arrival for determining morbidity risk, mortality risk and growth during the production cycle. Data were collected between June and October 2018, from 240 calves upon arrival and a subset of 160 calves 72 h post arrival at a veal research facility in Ontario, Canada. DCC were evaluated using the QScout BLD test for leukocyte differential cell counts (Advanced Animal Diagnostic, Morrisville, NC). All calves were screened using a standardized protocol and a blood sample was collected to evaluate serum total protein (TP) and DCC. Cox proportional hazards models were constructed for both morbidity and mortality outcomes. Mixed linear regression models were constructed for the outcome of average daily gain. Models were constructed in Stata 15 (StataCorp LP, College Station, TX). Results from data collected at the time of arrival suggest that TP values >5.1 g/dL reduce the hazard of mortality (HR = 0.29, P < 0.001) and a rectal temperature >39.6°C was associated with an increased hazard of morbidity (HR = 1.48, P = 0.04). Calves that were dehydrated gained less (<0.09 kg/d, P = 0.03), however, an increased lymphocyte count was associated with calves having a higher level of growth (+0.05 kg/d, P = 0.02). Results from DCC collected 72 h post arrival suggest that lymphocyte counts between 4.8 and 5.8 × 10^9 cells/L decrease the hazard of mortality (HR = 0.22, P = 0.03) and >7.0 × 10^9 cells/L decrease the hazard of morbidity (HR = 0.56, P = 0.02), whereas, neutrophil counts >6.0 × 10^9 cells/L increased the hazard of mortality (HR = 5.2, P = 0.02). This study demonstrates that machine DCC at the time of arrival and 72 h post-arrival has potential for use in calf risk identification protocols in veal and dairy beef facilities.

Key Words: male dairy calf, biomarker, risk factors

Effect of colostrum replacer to ameliorate a disease bout in preweaned calves on an automated feeder. M. Cantor*, M. Woodrum Setser1, D. Renaud2, and J. H. Costa1, 1University of Kentucky, Lexington, KY, 2University of Guelph, Guelph, ON, Canada.

Changes in feeding behavior monitored through an automated milk feeder (AMF) have been associated with disease development. The objective of this study was to determine if an intervention with 1 dose (375g) of colostrum replacer (CR; PreMolac Plus, Zinpro, MN) or a placebo milk
replacer (28% CP 20% fat, Cows Match, Land O Lakes, MN) fed across 3 d (1L 125g/d) to triggered alarm calves (n = 110 alarms; n = 57 placebo, n = 53 CR) could lower the likelihood of a disease bout occurring (ameliorate) before weaning. An algorithm was set to trigger an alarm when negative deviations of milk intake or drinking speed were detected in relation to a baseline average of 12 d. Calves (42 placebo; 42 CR) were enrolled on the AMF at age 4.0 ± 2.0 d (mean ± sd), were offered 10 L/d milk replacer and had ad libitum access to starter measured by automated feeders. Calves were scored daily for bovine respiratory disease (BRD) and diarrhea and weighed and scored using a lung ultrasound 2x weekly. A BRD score >4 and an area of consolidated lung >2.9 cm² was considered a BRD bout. Treatments were not different on the d before alarm by health status, weights, and ages, alarms were triggered at average 32.1 ± 12.5 d of age (mean ± sd). The effect of CR to ameliorate BRD and diarrhea were calculated with logistic models using SAS (9.4), time was a fixed effect, with milk intake as a co-variante. The effect of CR on ADG was determined using a linear mixed model with dam parity and BRD status as co-variates, repeated by d and calf, with birth date as a random effect. Post-intervention, placebo calves had a 1.64 (95% CI: 1.10–2.43) times greater odds of having a BRD bout compared with CR calves for the 7-d following intervention. Moreover, placebo calves had a 1.50 (95% CI: 1.10–2.1) times greater odds of having lung consolidation than CR calves. No difference was found in the likelihood of diarrhea (OR 0.91; 95% CI: 0.73–1.12) or ADG (placebo 0.73 ± 0.07 kg/d) and CR (0.70 ± 0.08 kg/d) between interventions. Results suggest CR may reduce the likelihood of a BRD bout in calves, but not influence growth. Future research should examine which properties of CR ameliorate BRD bouts.

Key Words: bovine respiratory disease, performance, supplement

191 Effects of different blood buffers administered in electrolyte solution to grain-fed veal calves experiencing diarrhea. D. R. Wood*,1, R. M. Blome1, L. C. Ribeiro1, A. J. Keuken2, B. W. Keuken2, and D. L. Renaud3, 1Animix, Juneau, WI, 2Mapleview Agri, Palmerston, ON, Canada, 3Department of Population Medicine, University of Guelph, Guelph, ON, Canada.

The objective of this randomized controlled trial was to examine differences between treating male dairy calves experiencing diarrhea with either a basic electrolyte powder (BBP) composed of sodium bicarbonate (50.7 mmol/L), a mixed buffer powder (MBP) including sodium bicarbonate (33.8 mmol/L), sodium citrate (8.4 mmol/L), sodium acetate (6.3 mmol/L) and potassium citrate (1.9 mmol/L), or a liquid electrolyte composed of sodium acetate (50.1 mmol/L) (LSA). All 3 electrolyte solutions provided 50 mmol/L of blood buffers and a similar strong ion difference. Holstein male calves sourced from auction barns and local dairies were delivered in one batch to the research site. Calves were housed in individual pens and fed a 24% CP and 17% fat milk replacer (MR) twice daily. Starter grain and water were offered ad libitum. A total of 45 calves were randomly enrolled in 1 of the 3 treatments (MBP: n = 14; HAL: n = 16; BBP: n = 15) when experiencing either 2 consecutive days of a fecal score 2 (runny, spreads easily) or 1 day with a fecal score of 3 (liquid void of solid material). Calves were blocked by the different enrollment criteria. The respective electrolyte was administered via esophageal tube one hour after feeding MR until the fecal score returned to a normal or pasty consistency. Blood gas measures were taken at 1, 8, and 24 h post the initial electrolyte feeding and weight was measured at 1, 2, 7, 14, and 28 d post-enrollment. Mixed repeated measures linear regression models were built using STATA 14 to assess the impact that the electrolyte had on the blood gas parameters and BW. Statistical significance was defined as P < 0.05. As compared with BBP, MBP significantly increased blood CO2 at 8 and 24 h, bicarbonate at 24 h, base excess at 8 and 24 h, and anion gap at 24 h, all indicative of improved blood pH. Feeding LSA noted similar results to MBP. However, LSA had a significantly higher BW on d 2 as compared with MBP. Although a severe dehydration challenge was not present, MBP improved acid-base status of calves compared with BBP, whereas LSA performed similarily to MBP.

Key Words: calf, veal, electrolyte

192 Production and bioactivity of anti-Streptococcus equinus antibodies. G. Balieiro Neto*,1, L. E. Ferreira2, A. Dauria3, and L. Bertelli2, 1Animal Science Institute of Department of Agriculture and Food Supply, Ribeirão Preto, São Paulo, Brazil, 2Premix, Ribeirão Preto, São Paulo, Brazil.

Organisms previously classified as Streptococcus bovis (i.e., S. equinus) are common in the rumen and feces and have been described as commensal bacteria in humans and animals. They may act as opportunistic pathogens contributing to ruminal acidosis and mastitis. Any microorganism that colonizes the rumen must possess the capability of adherence to the ruminal surface for multiplication. The adhesins responsible for bacterial adhesion are generally targets of antibodies that can inhibit attachment. In this study we evaluated the production and bioactivity of antibodies against S. equinus. Twenty-four hens allocated to 8 cages were divided in 2 groups: one group was immunized with the control vaccine (adjuvant plus phosphate-buffered saline) and the other was administered the test vaccine containing S. equinus strain JB1 as the antigen. The IgY concentrations in egg yolks were determined with Chicken IgY ELISA Kit Fine Test and analyzed by the unpaired t-test. IgY bioactivity was evaluated by plate trapped antigens-enzyme linked immuno sorbent assay (PTA-ELISA). In the PTA-ELISA 5.3 x 10^8 colony-forming units/mL of S. equinus were pre-coated onto the wells of a multi well-plate for both control and sample testing. These wells were incubated with serially diluted anti-S. equinus antibody and then with the second antibody-enzyme conjugate followed by the chromogenic enzyme substrate in duplicate. The control and test production were 22.5 and 104.1 mg/yolk of IgY, respectively. The PTA-ELISA revealed high yield bioactivity of IgY against S. equinus, and the 1:16 dilution was selected for greater formation of antibody-antigen complexes. Both antibody affinity and the accessibility of epitopes on the plate are critical factors in determining whether the diluted antibody levels exceed the threshold required for complex formation. These results provide a good approximation of the optimal relationship between antigen and antibody, guiding the dosages in further animal tests.

Key Words: antibody-antigen complex, immunization, microbiome