
Bovine respiratory disease (BRD) is a common disease concern in dairy cattle that is most commonly initially diagnosed in young dairy heifers. BRD has a negative impact at both the individual animal level and at the herd level, but this performance loss is highly variable, depending on disease severity, accuracy and completeness of clinical detection, effectiveness of treatment, and on-farm culling practices. Consequences include decreased rate of weight gain, a higher culling risk either as heifers or as cows, delayed age at first service, delayed age at first calving, and in some cases, lower future milk production. In this data set of 104,100 Holstein dairy replacement heifers from across the US, 36.6% had one or more cases diagnosed within the first 120 d of age with the highest risk of new cases occurring before weaning. Comparison of the raising cost for Holstein heifers with BRD and those without a recorded history of BRD resulted in an estimated cost per incident case occurring within the first 120 d of age of $252 or $282, depending upon whether anticipated future milk production differences were considered or not. No additional differences in first lactation performance such as culling risk or reproductive performance were evaluated. Current market conditions as reflected in this model have contributed to a cost estimate that is significantly higher than previously published estimates, driven in part by the losses associated with selective culling of a subset of heifers that experienced BRD. Depending on the available inventory of replacement heifers and the level of BRD within the herd, selective culling based on disease occurrence may limit a herd’s ability to selectively cull based on genetics; however, this financial cost was not considered here. The cost of BRD in dairy replacement heifers presented here is likely higher than many realize when all aspects of growth and performance are considered but may not completely capture the full economic losses.

Key Words: bovine respiratory disease, dairy replacement heifer, economics

Associations of serum protein concentrations with serum metabolites, average daily gain, and health measures during the early stages of growth in Holstein dairy calves. B. J. Tverdy*, C. Y. Tsai1, H. C. Hung1, P. Rezamand2, and W. J. Price2, 1Department of Animal and Veterinary Science, University of Idaho, Moscow, ID, 2Statistical Programs, College of Agricultural and Life Sciences, University of Idaho, Moscow, ID.

An objective of this study was to determine the associations of passive transfer status, by assessment of serum total protein (TP), with serum metabolites, daily gain, morbidity, and mortality in neonatal Holstein dairy calves (n = 1,558). Calves were purchased from dairy farms in the western United States and placed in a calf ranch as one day old. Calves were assigned an individual electronic identification and entered into Feedlot Health Management Services proprietary software, iFHMS (Feedlot Health Management Services, Preston, ID). Cause-specific morbidity and mortality was recorded for each calf daily from entry to exiting or death. A 5-mL tube of blood was collected from each animal at 48 ± 6 h post-arrival. Whole blood was centrifuged at 2000 g for 10 min and serum was stored at −20°C. Serum TP was measured using a digital refractometer. Serum TP was measured using a reverse-phase HPLC using a C18 column for vitamins and a colorimetric assay for glucose. Data were analyzed using GLIMMIX and logistic regression models with significance declared at P < 0.05. Significant differences between poor and excellent were observed in mortality and ear disease treatments (P < 0.05 for both). Differences were observed when comparing poor and fair to good and excellent TP categories for serum glucose (P < 0.05). Differences were also detected when comparing poor with all other groups for serum retinol (P = 0.001). Serum β-carotene and α-tocopherol were different when comparing all TP categories against the excellent (P < 0.05 for both). Average daily gain at 90 d and overall was not statistically different among TP categories. Overall, serum metabolites were different among TP categories, suggesting an associative relationship with health and the immune system.

Key Words: passive transfer, metabolites

Growth, rectal temperature, and health of male Holstein calves exposed to heat stress during pre-weaning. A. B. Montevéchío*, W. Frota1, V. R. Merenda1, J. G. Martin III2, and R. C. Chebel1, 1Department of Large Animal Clinical Sciences & Department of Animal Sciences, University of Florida, Gainesville, FL, 2Dairy Design Engineers, Gainesville, FL.

Objectives were to determine the effects of heat stress exposure of pre-weaned male Holstein calves on rectal temperature (RT), growth, and health. At birth, calves were paired according to the dam’s parity (1st vs ≥2nd) and were assigned randomly to 1 of 3 treatments: 50% of the hatch covered with plywood and outside of the barn (HS = 20), hatch in a barn with no cooling (SH = 21), and hatch in a barn with cooling through forced air (SHF = 19). At birth, calves were weighed and, within 48 h, total protein in serum and failure of passive transfer (<5.5 vs. ≥ 5.5 g/dL) were determined. All calves were weighed (BW) and had the rum (RH) and wither (WH) heights measured at 12, 19, 26, 34, 47, 54, 61, and 71 d of age (weaning). Health was scored in the AM, including RT, every 3.5 ± 1.1 d from 2 to 68 d of age. A set of hitches (HS = 16, SH = 8, SHF = 15) was evaluated for air speed and temperature at 1000 and 1600 h and calves in these hitches had RT and respiratory frequency (RF) measured at the same time. Data were analyzed by ANOVA for repeated measures. At birth, treatments did not differ (P > 0.10) regarding BW, RH, WH, failure of passive transfer. The SHF treatment had (P < 0.01) the greatest air velocity (AM: HS = 0.60 ± 0.07, SH = 0.41 ± 0.09, SHF = 1.41 ± 0.09 m/sec; PM: HS = 0.66 ± 0.07, SH = 0.50 ± 0.10, SHF = 1.38 ± 0.10 m/sec) and HS treatment had (P < 0.01) the greatest air temperature (AM: HS = 33.40 ± 0.12, SH = 30.17 ± 0.19, SHF = 30.25 ± 0.16°C; PM: HS = 33.91 ± 0.18, SH = 32.74 ± 0.27, SHF = 32.61 ± 0.24°C). In the AM, SH calves had the greatest RT (HS = 38.66 ± 0.04, SH = 38.79 ± 0.04, SHF = 38.60 ± 0.04°C) but, in the PM, HS calves had the greatest RT (HS = 40.07 ± 0.07, SH = 39.05 ± 0.10, SHF = 38.97 ± 0.09°C). Calves in the HS treatment had the greatest RF (AM: HS = 73.63 ± 3.65, SH = 38.44 ± 3.05, SHF = 38.66 ± 2.58 mov/min; PM: HS = 92.27 ± 3.44, SH = 42.22 ± 2.56, SHF = 37.29 ± 1.95 mov/min). Treatment did not affect BW and average daily gain from 12 d of age to weaning, but HS calves had reduced RH (HS = 94.58 ± 0.70, SH = 96.29 ± 0.70, SHF = 97.10 ± 0.76 cm) and WH (HS = 88.52 ± 0.76, SH = 89.88 ± 0.76, SHF = 91.39 ± 0.83 cm) at weaning. Exposure to HS reduces body measurements of male Holstein calves.

Key Words: heat stress, Holstein, growth

Passive immunity and colostrum management practices on Ontario dairy farms and auction facilities: A cross-sectional study. C. B. Winder*, J. Marshall1, B. Tuer1, R. Genore2, and D. L. Renaud2, 1Department of Population Medicine, University of Guelph, Guelph, ON, Canada, 2ACER Consulting, Guelph, ON, Canada.

Failure of transfer of passive immunity (FTPI) in dairy calves has substantial health consequences, impacting well-being and performance. There have been no recent estimates of the prevalence of FTPI on Ontario dairy farms. The objectives of this cross-sectional study were to determine the level of FTPI in both male and female dairy calves across the province of Ontario, as well as determine colostrum management practices through
an in-person questionnaire. One hundred and 9 dairy farms and 4 auction facilities in Ontario were visited in 2019. From the auction facilities, 386 male dairy calves were sampled and had a mean serum total protein (STP) of 5.79 g/dL (SD = 0.83). Using a cutpoint of 5.2 g/dL, 91 calves (24%) had FTPI. Of the 440 calves (201 male, 239 female) sampled on Ontario dairy farms between 24 h and 10 d of age, mean STP was 5.69 g/dL (SD = 0.78) and 107 calves (24%) had FTPI. The likelihood of FTPI was not associated with sex (female v. male, RR = 0.89, 95% CI = 0.64–1.24), age (per day, RR = 1.02, 95% CI = 0.94–1.11), or weight (per kg, RR = 0.98, 95% CI = 0.96–1.01). For first feeding of colostrum, median time to providing colostrum was 2.5 h (range = 0 to 12 h). Ninety-one farms (83%) fed colostrum from the dam of the calf as their predominant source of colostrum. The predominant feeding method for the first feeding of colostrum was a nipple bottle (89 farms, 82%). Twenty-seven farms (25%) reported managing colostrum differently for male calves, which included a different colostrum source (7 farms), use of poorer quality colostrum (3 farms), a smaller quantity of colostrum (3 farms), a longer time from birth to feeding (1 farm), and generally having a lower focus on colostrum management for male calves (9 farms). While the prevalence of FTPI on Ontario dairy farms appears to have improved since previous estimates, there remains substantial room for improvement. Although no overall differences were found in FTPI between male and female calves, differential reported colostrum management by sex indicates this may be a risk for male calves on a proportion of Ontario dairy farms.

Key Words: calf, failure of transfer of passive immunity (FTPI), failure of passive transfer (FPT)

265 Lactobacillus animalis LA51 and Bacillus sp. probiotics confer protection from the damaging effects of pathogenic Clostridium perfringens and Escherichia coli on the intestinal barrier. G. Copani*, O. C. M. Queiroz, and E. J. Boll, Animal Health and Nutrition, Chr. Hansen A/S, Hørsholm, Denmark.

Toxins produced by Clostridium spp. can cause enteric disease in ruminant. The gut plays a key role in the digestion and absorption of nutrients and constitutes an initial organ exposed to external factors influencing the health of animals. Intestinal dysbiosis can promote overgrowth of different pathogens, which can cause intestinal barrier damage (leaky gut), which in turn may facilitate passage of toxins to the bloodstream. The objective of this study was to evaluate in vitro beneficial effects of different probiotic strains (Lactobacillus animalis (LA51), Bacillus licheniformis DSM5749 (BL) and Bacillus subtilis DSM5750 (BS)) on gut health in the presence of pathogens. Two assays were performed. For the adhesion assay, E. coli O157 (DSM17076) was added to intestinal Caco-2 cell monolayers (3×10⁷ cfu/well) pre-incubated or not with BL or BS (1.5×10⁹ cfu/well). E. coli adhesion was quantified by cfu enumeration using MacConkey agar plates incubated 18h at 37°C. For the “leaky gut” assay, transepithelial electrical resistance (TEER) was measured across Caco-2 monolayers exposed to live or dead LA51 (2x10⁶ cfu/transwell) with or without Clostridium perfringens type a (CPa) (DSM756, 2x10⁸ cfu/transwell). FITC-dextran (FD) was added to the apical side of the Caco-2 cells after 5h of TEER measurements. The amount of FD translocated to the basolateral side was quantified after 5h by measuring the fluorescent signal. BL and BS reduced the binding of E. coli O157 to the cells by 78% and 51%, respectively (6.7x10⁶ cfu/mL vs. 1.5x10⁶ or 3.3x10⁶ cfu/mL, P < 0.01). CPa caused a TEER decrease over the time, while live (but not dead) LA51 significantly reduced the TEER decrease (15 Ω cm² vs. 150 Ω cm², P < 0.01) and the amount of FD translocation (5.7% vs. 0.1%, P < 0.01). In conclusion, LA51 confers protection against Clostridium perfringens type a by counteracting its damaging effect on the intestinal integrity, while BL and BS reduce the adherence in vitro of pathogenic E. coli.

Key Words: Lactobacillus animalis, Clostridium perfringens, Bacillus licheniformis

266 Effects of feeding Saccharomyces cerevisiae fermentation products on the health of Holstein dairy calves following a lipopolysaccharide (LPS) challenge. R. N. Klopp*, I. Yoon², and J. P. Boerman³, ¹Purdue University Department of Animal Sciences, West Lafayette, IN, ²Diamond V, Cedar Rapids, IA.

Our objective was to evaluate the effect of Saccharomyces cerevisiae fermentation products (SCFP) on the immune status of calves, just before weaning, following an LPS challenge. Calves were blocked by BW and serum total protein and assigned to 1 of 2 treatments; CON (24% CP:17% fat milk replacer (MR) and an 18% CP starter) or SCFP (24% CP:17% fat MR with 1 g/d of SmartCare (Diamond V) and an 18% CP starter with 0.8% NutriTek (Diamond V)). Calves were offered 2.84 L (12.5% solids) of MR twice daily (0630 and 1630 h). Calves received ad libitum access to a texturized starter and water. On d 49 (pre-challenge) and d 52 (post-challenge), blood was collected to measure blood fractions (Genesis, Oxford Science, Oxford, CT). On d 50, 20 calves (10/treatment) were enrolled in an LPS (E. coli O111:B4) challenge. Calves were intravenously dosed with 0.125 µg/kg of BW. At −1.5, −0.5, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 5, 6, 7, 8, and 24 h, relative to LPS, 20 mL of blood was collected via a jugular catheter, and temperature and respiratory rate were measured. Data were analyzed as a completely randomized block design in SAS v.9.4 with repeated measures. At 0.5 h, SCFP calves had an increased temperature (39.5°C vs. 39.0°C; P = 0.04) and respiration rate (103 vs. 80 breaths/min; P = 0.002) compared with CON calves. At 1.5 h, SCFP calves had an increased respiration rate (82 vs. 64 breaths/min; P = 0.02) compared with CON calves. On the day of the LPS challenge, SCFP calves consumed 933 g less starter compared with the CON calves (P = 0.002). There were no intake differences after the day of the LPS challenge (P > 0.29). For the blood fractions, there was a significant time point effect for white blood cells (10⁵/μL), lymphocytes (10⁵/μL), eosinophils (10⁵/μL and %), basophils (10⁵/μL and %), red blood cells (10⁹/μL), and hemoglobin (g/dL; all P < 0.01). This suggests an LPS challenge impacted blood fractions of calves, indicating immune system activation. Using an LPS model, SCFP caused a more acute response, potentially because of a primed immune system.

Key Words: calf, Saccharomyces cerevisiae fermentation products, LPS challenge