Graduate Student Competition: ADSA Production Division Poster Competition, PhD Division

T129 Hepatic gluconeogenesis in dairy cows as affected by dietary starch level and supplementation with monensin during early lactation. M. M. McCarthy*[1], T. Yasui[1], S. H. Pelton[1], C. M. Ryan[1], G. D. Mechor[2], and T. R. Overton[1], *[1]Cornell University, Ithaca, NY, [2]Elanco Animal Health, Greenfield, IN.*

The objectives of this study were to determine the effects of postpartum dietary starch level and supplementation with monensin (M) on rates of in vitro hepatic gluconeogenesis and oxidation from propionate. Primiparous (n = 17) and multiparous (n = 37) Holstein cows were fed a high starch (HS) or low starch (LS) early lactation diet with 0 or 450 mg/d M by topdress in a 2 (starch) × 2 (M) factorial arrangement. Prior to parturition all cows received a common controlled energy diet ad libitum with a daily topdress of either 0 or 400 mg/d M, depending on early lactation treatment assignment. From parturition until d 21 cows were fed HS TMR (26.2% starch, 34.3% NDF, 22.7% ADF, 15.5% CP) or LS TMR (21.5% starch, 36.9% NDF, 25.2% ADF, 15.4% CP) with a daily topdress of 0 or 450 mg/d M. Biopsies were obtained on d 7 (± 4) postpartum and liver slices used in an in vitro incubation system to determine liver capacity to convert [1-^{14}C]propionate to CO_2 and glucose. Interactions of starch × M were not significant. There was no effect of starch or M treatment on liver capacity to oxidize propionate to CO_2, and effects of starch on gluconeogenesis were not significant. Cows fed M tended (P=0.14) to have greater capacity to convert propionate to glucose than controls. Primiparous animals had greater capacity for oxidation and gluconeogenesis from propionate than multiparous animals (P = 0.04 and 0.01, respectively). In vitro incubation with insulin (10 n*M*) tended to decrease propionate oxidation to CO_2 (P = 0.10) but had no effect on propionate conversion to glucose. The ratio of rates of conversion of radiolabeled propionate to glucose and CO_2 provide an index of the efficiency of propionate utilization for gluconeogenesis; M supplementation increased the ratio of glucose to CO_2 (P = 0.05), which indicates that cows fed M have a greater propensity to convert propionate to glucose. Overall, primiparous cows had greater capacity to both oxidize and convert propionate to glucose than did multiparous cows and M increased hepatic capacity to convert propionate to glucose relative to CO_2.

Key Words: early lactation, gluconeogenesis, monensin

T130 Effect of postruminal propionate infusion on expression of key genes for gluconeogenesis in the liver of lactating dairy cows. Q. Zhang*, H. A. Tucker, K. E. Boesche, J. E. Sibray, S. L. Koser, and S. S. Donkin, *Purdue University, West Lafayette, IN.*

Propionate is the major precursor for gluconeogenesis in ruminants. Glucose demand during lactation is met through increased availability of gluconeogenic precursors, including propionate, as a consequence of greater feed intake. This experiment evaluated the effect of increased postruminal propionate supply on hepatic expression of phosphoenolpyruvate carboxykinase-cytosolic (PEPCK-C), phophoenolpyruvate carboxykinase – mitochondria (PEPCK-M) and glucose-6-phosphatase (G6P), three rate-limiting enzymes for gluconeogenesis in bovine liver. Six multiparous mid-lactation Holstein cows were utilized in a replicated 3 × 3 Latin square. Periods consisted of a 6-d acclimation and washout phase followed by 8-h infusion. Solutions delivered 1.67 mol propionate, 0.84 mol glucose, or an equivalent volume of water over 8-h period. On the day of infusion, blood samples were collected at 0,2,4,6, and 8-h relative to the start of infusion for blood propionate, glucose, and insulin analysis and liver biopsy samples were collected at the end of infusion for mRNA analysis. Plasma propionate tended to increase at 8-h relative to start of infusion with propionate infusion (0.059 m*M* vs. 0.044 m*M* vs. 0.037 m*M* for propionate, glucose and water, respectively; P = 0.07). Plasma glucose was not affected by treatments (P > 0.1). Serum insulin was increased (P < 0.05) 1.47-fold by glucose and1.74 fold by propionate compared to water infusion. There was a tendency for PEPCK-C expression to differ (P = 0.1) among treatments (1.45 vs. 0.65 vs. 1.33 arbitrary units, for propionate, glucose and water, respectively). Propionate tended to increase PEPCK-C expression compared to isocaloric glucose infusion (P = 0.1). Expression of PEPCK-M and G6P mRNA were not affected by treatments (P > 0.1). These data indicate in vivo effects of propionate to alter hepatic gene expression in mid-lactation dairy cows that is tempered by a commensurate increase in serum insulin concentration.

Key Words: propionate, gluconeogenic gene expression, lactating dairy cow

T131 Regulation of pyruvate carboxylase expression by fatty acid cocktails in Madin-Darby bovine kidney cells. K. E. Boesche*, S. L. Koser, and S. S. Donkin, *Department of Animal Sciences, Purdue University, West Lafayette, IN.*

Pyruvate carboxylase (PC) catalyzes oxaloacetate synthesis, a key reaction for both gluconeogenesis and fatty acid oxidation. Activity of this enzyme is linked to PC mRNA and is increased during feed restriction and transition to lactation, metabolic states when non-esterified fatty acids (NEFA) are elevated in blood. Saturated fatty acids, including C18:0, decrease expression of PC while intracellular signals related to unsaturated fatty acid metabolism act to increase PC expression in Madin-Darby bovine kidney (MDBK) cells. The objective of this study was to determine dominance of control of PC mRNA expression in MDBK cells with copresence of saturated and unsaturated fatty acids. MDBK cells were cultured to 80% confluence and exposed to fatty acid treatments for 24h. Single fatty acid treatments consisted of 1.0 m*M* of either C16:0, C18:0, or C18:3n-3 *cis*. Fatty acid cocktails (1 m*M* total) were supplied as increasing concentrations of C18:3n-3 *cis* (0.25 m*M*, 0.5 m*M*, 0.75 m*M*) combined with decreasing concentrations of either C16:0 (0.75 m*M*, 0.5 m*M*, 0.25 m*M*) or C18:0 (0.75 m*M*, 0.5 m*M*, 0.25 m*M*). Saturated fatty acid treatments of either 1.0 m*M* C16:0 or 1.0 m*M* C18:0 decreased (P < 0.05) PC expression by 72.2% and 92.9%, respectively. Cells exposed to 1.0 m*M* C18:0 had significantly lower (P < 0.05) PC expression when compared to C18:0 treatment combined, at any level, with C18:3n-3 *cis*. While the lowest evaluated concentration (0.25 m*M*) of C18:3n-3 *cis* proved enough to ameliorate PC expression with exposure to 0.75 m*M* C18:0, only the highest inclusion level of C18:3n-3 *cis* (0.75 m*M*) with C16:0 (0.25m*M*) could recover PC expression to levels similar to control. Data indicate that C18:3n-3 *cis* is a more potent alleviator of PC depression caused by C18:0 than similar effects resulting from C16:0 exposure. The activation of PC mRNA by unsaturated fatty acids may play a critical role in setting the capacity for fatty acid oxidation.

Key Words: fatty acid, gluconeogenesis, pyruvate carboxylase

T132 Lying time, lameness and leg injuries on freestall farms in China. Y. Liang*[1,2], Y. Wang[3], G. I. Zanton[2], M. A. Vazquez-Anon[2], D. M. Weary[1], and M. A. G. von Keyserlingk[1], *[1]Animal Welfare Program, University of British Columbia, Vancouver, Canada, [2]Novus International Inc., St. Louis, MO, [3]Novus International Inc., China.*

The aim of the study was to describe variation in lying time, lameness, and leg injuries among Holstein herds in two prominent dairy regions in China: Beijing (14 herds) and Huadong (25 herds). One trained individual evaluated one group of high production cows in each of the herds. Cows were gait scored using a 5-point Numerical Rating System where 1 and 2 are considered non-lame, ≥3 clinically lame, and ≥4 severely lame. Hock injuries were scored on a scale of 1 to 5 (1=healthy and 5=severe swelling or severe lesion). Knee injuries were based on a 1 to 3 scale (1=healthy, 2=hair loss and 3=evident swelling). The analyses were descriptive and all results are presented as means ± standard deviation. Herd size in the Beijing region averaged 807 ± 701 milking cows (range 184 to 2444) and 1737 ± 2115 cows (range 160 to 8873) in Huadong. Lying times and lameness were similar in the two regions: lying time averaged 11.3 ± 0.54 h/d (range 10.3 to 12.3 h/d) and 11.4 ± 1.01 h/d (range 9.1 to 13.1 h/d); prevalence of clinical lameness averaged 29 ± 10.5% (range 15% to 46%) and 29 ± 13.7% (range and 6% to 51%); and prevalence of severe lameness averaged 10 ± 7.7% and 8 ± 6.0% in Beijing and Huadong, respectively. Knee and hock injuries were less prevalent in Beijing versus Huadong: prevalence of swollen knees averaged 4 ± 4.1% versus 16 ± 9.2%; prevalence of hock injuries (≥2) averaged 37 ± 11.3% and 41 ± 24.6; and prevalence of severe injuries (score ≥4) averaged 1 ± 1.2% and 7 ± 10.7% in Beijing and Huadong, respectively. Previous work on North American farms has demonstrated that the use of deep bedding is highly protective for leg injuries. We therefore suggest that the lower rates of knee and hock injuries in Beijing were likely associated with most farms in this region using deep-bedded stalls, but more work is now required to identify farm management factors associated with injuries and other indicators of cow comfort on farms in these regions of China.

Key Words: lying time, hock injuries, knee injuries

T133 Colostrum replacer feeding regimen, addition of sodium bicarbonate, and milk replacer: The combined effects on absorptive efficiency of IgG in neonatal calves. R. G. Cabral*[1], M. A. Cabral[1], C. E. Chapman[1], D. M. Haines[2], and P. S. Erickson[1], *[1]University of New Hampshire, Durham, [2]Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada.*

Eighty Holstein and Holstein cross dairy calves were blocked by birth date and randomly assigned to 1 of 8 treatments within each block. The objective of this experiment was to examine the effect of colostrum replacer (CR) feeding regimen, supplementation of CR with sodium bicarbonate ($NaHCO_3$), and provision of a milk replacer (MR) feeding on IgG absorption. Calves were offered CR containing 184.5 g/L of IgG in either 1 feeding at 0 h (within 30 minutes of birth), with or without 30 g of $NaHCO_3$, with or without a feeding of MR at 6 h, or 2 feedings of CR (123 g/L of IgG at 0 h with or without 20 g of $NaHCO_3$ and 61.5 g/L at 6 h with or without 10 g of $NaHCO_3$), with or without a MR feeding at 12 h. Blood samples were obtained at 0, 6, 12, 18, and 24 h after birth and were analyzed for IgG via radial immunoassay. Results indicated that CR feeding regimen, MR treatments, and the interactions CR*Na, CR*MR, and CR*Na*MR were not significant for 24 h serum IgG, apparent efficiency of absorption (AEA), or area under the curve (AUC). Serum IgG at 24 h ($P < 0.0001$), AUC ($P < 0.0001$) and AEA (P = 0.0002) were decreased with addition of $NaHCO_3$ compared to calves not receiving $NaHCO_3$ (12.6 g/L vs. 16.08 g/L; 236.67 g/L·h vs. 314.50 g/l·h; and 24.8% vs. 31.07% respectively). There was a trend ($P = 0.09$) for a Na*MR interaction in reference to AUC indicating that feeding MR without $NaHCO_3$ supplementation (295.2 g/L·h) or not feeding MR with $NaHCO_3$ (229.2 g/L·h) is not beneficial compared to feeding neither MR nor $NaHCO_3$ (333.8 g/L·h), or feeding MR with $NaHCO_3$ (244.1 g/L·h). These data indicate that supplementation of CR with $NaHCO_3$ is not beneficial to IgG absorption and feeding MR within 6 h of CR feeding does not impact IgG absorption.

Key Words: colostrum replacer, sodium bicarbonate, milk replacer

T134 Serotonin (5-HT) increases gene expression of fatty acid enzymes and activates pAMPK in the mammary gland of transition rats. J. Laporta*, S. Weaver, C. Cronick, K. E. Merriman, T. L. Peters, and L. L. Hernandez, *University of Wisconsin-Madison, Madison.*

Fatty acids are fundamental to energy production and storage, cellular structure and are critical to the synthesis of milk fat. The role of serotonin (5-HT) in regulating milk protein gene expression in the mammary gland is established, however little is known regarding 5-HT's role in fatty acid metabolism in the mammary gland. Serotonin is synthesized in a two-step reaction from the amino acid L-tryptophan (L-TRP). The rate-limiting step is catalyzed by tryptophan hydroxylase (TPH1) to form 5-hydroxytryptophan (5-HTP), and 5-HTP is then converted directly into 5-HT. To explore the role of 5-HT in mammary gland fatty acid synthesis and energy expenditure during the transition period (9 d pre to 9 d postpartum) we fed 30 rats (n=15 per diet) 2 diets: (I) control (CON) and (II) 5-HTP (0.2% total diet). Blood was collected on d 9 of lactation to measure circulating 5-HT. Total RNA was isolated from mammary gland tissues collected on d 9 of lactation to measure the expression of peroxisome proliferator-activated receptor gamma (PPARG), leptin (LEP) and fatty acid synthase (FASN) by real time RT-PCR. Additionally, total protein was extracted from mammary glands to measure phosphorylated 5′ AMP-activated protein kinase (pAMPK, which regulates metabolic energy balance and metabolism of glucose and fatty acids) by western blot, and 5-HT by ELISA. Feeding 5-HTP effectively increased serum 5-HT concentrations over time ($P < 0.0003$). Mammary gland gene expression of PPARG, LEP and FASN was markedly up-regulated in the 5-HTP fed dams on d 9 of lactation ($P < 0.034$). Additionally, 5-HT concentrations were increased in the mammary gland of 5-HTP fed rats compared to CON ($P = 0.0083$). Finally, 5-HTP fed dams had significantly increased pAMPK compared to CON animals ($P = 0.006$). These results suggest the possibility that 5-HT is involved in regulating fatty acid and energy metabolism during the transition from pregnancy to lactation in the mammary gland of rats. However, the physiological significance and the mechanism of action regulating these findings needs to be further investigated.

Key Words: fatty acid, serotonin, lactation

T135 Effect of induced subclinical hypocalcemia (SCH) on physiological parameters and function of immune cells in dairy cows. N. Martinez*, L. D. P. Sinedino, R. S. Bisinotto, E. S. Ribeiro, G. C. Gomes, F. S. Lima, L. F. Greco, J. P. Driver, C. A. Risco, and J. E. P. Santos, *University of Florida, Gainesville.*

Objectives were to create a model to induce SCH [blood ionized calcium (Ca^{2+}) NC, 0.9% NaCl i.v. plus 43 g of oral Ca at 0 and 12 h) or an induced SCH (SCHI, 5% EGTA at pH 7.4, i.v.) in a crossover design. The infusion lasted 24 h. The sequence of treatments was either NC-SCHI or SCHI-NC. A 6-d period between treatment administrations was used to minimize carryover effects. Heart and respiratory rates, rectal temperature, and rumen contractions were measured during and after infusion at 6 to 12-h intervals. Ionized Ca, K, Mg, and blood pH were evaluated

at 0 h, hourly during the infusion period, and at 24, 48 and 72 h after the infusion to monitor Ca^{2+}. In addition, DMI, neutrophil function, and white blood cell differential count (WBC) were evaluated at 0, 24, 48 and 72 h after treatments. Data were analyzed using PROC GLIMMIX of SAS. Infusion of a 5% EGTA solution successfully induced SCH in SCHI cows (0.78±0.01 vs. 1.27±0.01 mM Ca^{2+}) during 23 h. There were no differences in heart and respiratory rates, rectal temperature, and WBC between SCHI and NC cows. On the infusion day, SCHI cows had lower ($P < 0.01$) K (2.92 ± 0.07 vs. 3.47 ± 0.07 m*M*) and higher ($P < 0.01$) Mg (0.94 ± 0.03 vs. 0.68 ± 0.03 m*M*) in blood. The decrease in blood Mg was likely caused by supplemental oral Ca in NC. SCHI cows had reduced ($P < 0.01$) DMI on the day of infusion (5.1 vs. 10.0 kg/d) and decreased ($P = 0.01$) rumen contractions every 2 min (1.7 vs. 2.7) in the second half of the infusion period. Cows in SCHI had a reduced ($P < 0.01$) percent of neutrophils with phagocytosis (79.9 ± 8.8 vs. 119.2 ± 13.0, % baseline) and oxidative burst (80.2 ± 17.9 vs. 140.3 ± 17.9, % baseline), evident at 24 h after the end of the infusion. A 5% EGTA solution successfully induced SCH in dairy cows. Subclinical hypocalcemia reduces DMI, rumen contractions and neutrophil function and it is suggested to be linked with peripartum immunosuppression.

Key Words: dairy cow, neutrophil, subclinical hypocalcemia

T136 Modification of AOAC method to measure total starch in animal feeds. S. D. Ranathunga*, J. L. Anderson, K. J. Herrick, and K. F. Kalscheur, *South Dakota State University, Brookings.*

Various methods are currently available to measure total starch in animal feeds. The ease of use, time spent on analysis, and cost per assay may vary between methods. The AOAC method 996.11 (1996) has been recognized as an accurate, repeatable, and efficient method to measure total starch. The objective of this study was to determine if an alternative starch method would be more economical and alleviate technical difficulties associated with the AOAC method. Modification of the AOAC method was done by combining the AOAC method with the acetate buffer method by M. B. Hall (2009) and using alpha-amylase (1200 liquefon units/assay) and amyloglucosidase (400 units/assay) concentrations from different sources (Ankom Technology Inc. and Sigma-Aldrich Inc.). The modified method was performed in sealable vessels. Nine samples including pure corn starch, TMR, concentrate mixture, alfalfa, corn silage, dried distillers grains with solubles, ground corn, dried fecal, and dried rumen samples were analyzed using the two methods. Two technicians performed two runs of each method. All samples were analyzed in duplicate within each run. The effect of method, technician, and run was analyzed using Tukey's test. Starch concentrations of the analyzed samples were not different between the two methods (pure corn starch = 101, TMR = 27.9, concentrate mixture = 33.3, alfalfa = 2.62, corn silage = 22.7, dried distillers grains with solubles = 4.51, ground corn = 72.7, fecal sample = 2.2 and rumen sample = 1.67% with SE of 0.15%). The average starch concentration for all samples (29.8% with ± 0.07% SE) was not affected by method ($P = 0.24$), technician ($P = 0.49$), nor run ($P = 0.59$). The average time spent to analyze 18 samples was around 3 h for both methods. Average cost per sample assayed with the modified method was $0.76 compared with $3.30 for the AOAC method. Therefore, the modified starch assay could be considered a more cost effective and less technically difficult method compared with the AOAC starch method.

Key Words: AOAC method 996.11, starch, feed analysis

T137 Concentrations of luteinizing hormone and ovulatory responses in dairy cows before timed AI. S. L. Pulley*[1], D. H. Keisler[2], and J. S. Stevenson[1], *[1]Kansas State University, Manhattan, [2]University of Missouri, Columbia.*

Our objective was to determine the incidence of spontaneous and GnRH-induced LH surges and ovulatory responses in lactating dairy cows enrolled in a timed AI (TAI) program. Cows were assigned randomly at calving to 2 treatments: 1) Pre10 (n = 37): two 25-mg injections of $PGF_{2\alpha}$ (PG-1 and PG-2) 14 d apart (Presynch); or 2) PG3G (n = 33): one 25-mg injection of PG 3 d before 100 µg GnRH (G-1), with a PG injection administered at the same time as PG-2. Cows were enrolled in a TAI protocol 10 d after PG-2 (Ovsynch; injection of GnRH 7 d before [G-2] and 56 or 72 h after [G-3] PG-3 with TAI at 72 h after PG-3). Blood was collected to determine LH at: (1) G-1: 0 to 80 h after PG-2 and hourly from 72 to 78 h (G-1 at 72 h); (2) G-2: 0 to 6 h after G-2; and (3) G-3: 0 to 80 h after PG-3 and hourly from 56 to 62 or 72 to 78 h for cows injected with GnRH (G-3) at 56 or 72 h after PG-3. Ovaries were scanned before injections and pregnancy per TAI (P/TAI) was diagnosed 31 d post-TAI by ultrasonography. The PG3G cows had increased ($P < 0.01$) incidence of induced LH surges in response to G-1 than Pre10 cows (75.8 vs. 0%). Proportion of cows with spontaneous (43.2 vs. 24.2%) or no LH surge (56.8 vs. 0%) was greater ($P < 0.01$) in Pre-10 than PG3G cows, respectively. An induced LH surge occurred in all cows at G-2 regardless of treatment. More ($P < 0.05$) cows had induced LH surges after G-3 at 56 (100%) than after 72 h (88.6%). Ovulation rate at G-1 was greater ($P = 0.003$) in PG3G (90.9%) than Pre10 (59.5%) cows, but did not differ at G-2 (PG3G = 51.5%; Pre10 = 61.2%). At G-3, ovulation was more ($P < 0.05$) likely in Pre10 than PG3G cows (94.6 vs. 84.9%) and after G-3 at 56 than 72 h (94.3 vs. 85.7%). The P/TAI for PG3G vs. Pre10 (56.7 vs. 37.8%) and for 56- vs. 72-h G-3 injections (54.5 vs. 38.2%) did not differ. We conclude that more PG3G cows had LH surges at G-1 compared with Pre10. Consistent with our earlier report, PG3G cows had increased ovulation rates at G-1 and greater ($P = 0.069$) progesterone at G-2 (4.1 vs. 2.7 ± 0.5 ng/mL) than Pre10 cows.

Key Words: Presynch, LH surge, pregnancy

T138 Discovery of genomic markers for gut health in dairy calves. G. Liang*[1], N. Malmuthuge[1], H. Bao[1], X. Sun[1], P. Stothard[1], T. B. McFadden[2], P. J. Griebel[3], and L. L. Guan[1], *[1]Department of Agricultural, Food and Nutritional Science, Edmonton, AB, Canada, [2]Divison of Animal Sciences, University of Missouri, Columbia, [3]Vaccine and Infectious Disease Organization, University of Saskatchewan, Saskatoon, SK, Canada.*

Enteric diseases significantly impair the health and productivity of both beef and dairy cattle. Moreover, it is well known that calf gut health is a critical determinant of a cow's lifelong performance and efficiency. MicroRNAs (miRNAs) are a large family of small, non-coding RNAs that have emerged as key regulators of gene expression involved in numerous biological processes including innate and adaptive immunity. We hypothesized that miRNAs regulate development of gut immune function and innate immune responses to enteric pathogens in pre-weaned dairy calves. In this research, expression profiles of miRNA and their potential target genes in the gut were characterized using next-generation sequencing analysis of small intestine tissues (ileum, mid-jejunum and distal-jejunum) collected from healthy calves at 1 week (n = 6), 3 week (n = 6), or 6 week (n = 6) postpartum. In total, 103,452,564 high-quality small RNA tags were obtained, of which 75,903,402 tags were mapped to a known bovine miRNA database (miRBase 19). The results showed that 495 known miRNAs were identified in distal-jejunum, 472 in mid-jejunum and 455 in ileum. Moreover, 141 candidate novel miRNAs were also detected from these tissues. Further analysis revealed that the expression pattern of some miRNAs known to be involved in regulation of immune

functions differed between calves of different ages and among different regions of the small intestine. For example, miRNAs of the bta-miR-29 and bta-miR-146 families, which may regulate immune responses and TLR signaling, respectively, were differentially expressed across the three ages. In addition, members of the bta-miR-10 and bta-miR-196 families, which may play crucial roles in the development of the intestinal mucosal immune system of dairy calves by regulating intercellular junctions, were differentially expressed. In conclusion, we have identified several miRNAs that were differentially expressed during the early life of dairy calves. These miRNAs may play a role in development of the gut immune system and therefore may be useful as molecular diagnostic markers to predict host response and susceptibility to enteric infections and diseases.

Key Words: dairy calf, gut health, microRNA

T139 Effects of an adjustable fan and mister cooling system with different motor size and water output on core body temperature (CBT) of lactating dairy cows. S. D. Anderson*[1], J. D. Allen[2], R. J. Collier[1], and J. F. Smith[1], *[1]The University of Arizona, Tucson, [2]Northwest Missouri State University, Maryville.*

Evaporative cooling in arid environments is effective in reducing heat stress on dairy cows during periods of high temperature. The FlipFan Dairy Cooling System (FLFN) is an adjustable fan and mister cooling system which is available in either 0.50 HP (372.85 W) or 0.75 HP (559.27 W) versions. In this study, water output of 0.50 HP FLFN ranged from 0.42 to 1.26 L/min per fan under 1,379 to 1,551 kPa of pressure, and 0.75 HP FLFN had water output of 0.40 to 3.14 L/min per fan under 689 to 6895 kPa of pressure. Misters in both systems automatically turned off when relative humidity (RH) exceeded 65%. Our objective was to determine if FLFN operated at 0.75 HP was more effective than 0.50 HP FLFN at lowering CBT of multiparous, lactating Holstein cows (46.7 ± 0.75 kg/milk per d, 143 ± 6 DIM) on a commercial dairy in Arizona. Twenty four cows were measured continuously in a switchback design for 8 d. Cows were housed in 1 of 2 pens with 12 study cows/pen. Pen served as the experimental unit. The study consisted of 4 2-d periods in which the first day served as an acclimation period, whereas data collected on the second day was used for statistical analysis. All cows were subjected to each cooling treatment twice. Mean daily dry-bulb temperature was 30.0 ± 0.80°C and ranged from 24.0°C to 36.3°C. Mean daily RH was 55.5 ± 2.16% and ranged from 39.9% to 73.2%. Mean daily temperature-humidity index (THI) was 78.8 ± 0.78 and ranged from 72.7 to 84.3. Mean 24-h CBT was lower ($P < 0.001$) for cows cooled by 0.75 HP FLFN compared to 0.50 HP FLFN (38.69°C vs. 38.84°C). Furthermore, mean hourly CBT was lower ($P < 0.001$) at all times of day for cows cooled by 0.75 HP FLFN. No treatment × time interaction was detected ($P = 0.3219$). Results suggest that 0.75 HP FLFN has greater cooling capacity as measured by lower CBT. However, additional work will be required to determine what situations warrant the additional electrical and water cost to operate the 0.75 HP FLFN. There may be different conclusions for different climates, stage of lactation, and parity.

Key Words: heat stress, adjustable fan, water output