715 Influence of dairy herd longevity and productivity on lifetime N use efficiency. J. M. Moorby*, *Institute of Biological, Environmental and Rural Sciences*, *Aberystwyth, UK*.

Excretion of excess dietary N from dairy cows contributes to environmental pollution, with ammonia, nitrate, and nitrous oxide being the major pollutants. Apparent efficiency of feed N use for milk protein production is typically about 25%, depending on diet. However, there are long periods when a dairy cow is not productive (during heifer growth and when dry) which reduce lifetime apparent N use efficiency (NUE) because the animal excretes N with little useful output at these times. This situation is exacerbated as cow longevity decreases, and the ratio of non-productive to productive periods of life increases. A simple modeling exercise was carried out to investigate the effect of dairy cow productivity and longevity on lifetime NUE of a dairy herd yielding an assumed fixed quantity of milk. Opportunistic losses in milk production caused by disease and infertility were included to take into account the number of extra animals required for target herd milk yield. N losses during growth (including heifer mortality), pregnancy, and culling were included. With an assumed baseline NUE largely determined by nutrition (e.g., 25%) herd longevity of milking cows with a mean lactation yield of 7,500 kg resulted in lifetime NUEs of 11.8, 18.6, 21.0, 22.1 and 22.7% for lactations 1 to 5 respectively. The response was well described (R^2 = 0.99) by a general saturation curve model (Morgan-Mercer-Flodin). For a fixed herd milk yield, increased individual animal productivity resulted in better lifetime NUE because of fewer cows in the herd (e.g., 19.7, 21.0, 21.8% for 5,000, 7,500, and 10,000 kg cows completing 3 lactations). This equates to less N excretion per kg milk produced by higher yielding cows. However, this assumes rates of disease incidence and longevity are unaffected by productivity, which may not be achieved in practice. In conclusion, for herds with very high replacement rates, overall lifetime NUE is significantly affected by animal longevity. For animals surviving for about 3 lactations or more the major factor determining lifetime NUE efficiency is nutrition, and the unproductive periods of the cow's life have a relatively minor influence.

Key Words: dairy cows, longevity, N use efficiency

716 Optimal dry period length and management to maximize production and health. D. E. Santschi*[1], C. L. Girard[2], R. I. Cue[3], D. Pellerin[4], and D. M. Lefebvre[1], [1]*Valacta*, *Ste-Anne-de-Bellevue, Qc, Canada*, [2]*Agriculture and Agri-Food Canada*, *Sherbrooke, Qc, Canada*, [3]*McGill University*, *Ste-Anne-de-Bellevue, Qc, Canada*, [4]*Université Laval*, *Québec, Qc, Canada*.

The objective of this study was to determine optimal dry period (DP) length to maximize milk production and facilitate transition according to management (MGMT) used. Data were obtained from a previous study comparing effects of short (SDP; 35d dry; pre-calving ration only) and conventional DP (CDP; 60 d dry; dry-off ration until d-21 and 21d of pre-calving ration). The current data set included information on 964 cows managed with either 21d (CDP) or 35d (SDP) of pre-calving ration. Optimal DP length was determined within each MGMT group. Fixed effects of the model were DP, parity, block, herd and DP*Parity in Proc GLIMMIX (disorder incidences) or Proc MIXED (other variables). For both MGMT groups, previous lactation ECM yield was not different among DP length groups ($P \geq 0.18$). Within the CDP MGMT strategy, DP ≤ 42d tended to lower incidence of ketosis but to increase incidence of retained placenta (RP) compared with the other DP lengths ($P \leq 0.09$). However, DP length did not affect average ECM yield in the following lactation ($P = 0.62$). Within the SDP MGMT strategy, DP ≤ 28d decreased incidence of ketosis ($P = 0.01$), but increased incidence of RP ($P = 0.01$). DP ≤ 28d also decreased average ECM yield compared with DP ≥ 29d ($P = 0.01$). No effect was observed on dystocia, displaced abomasum, metritis and milk fever in either MGMT group. DPxParity was not significant. Results suggest a minimal DP of 29d is required to maximize milk yield and facilitate transition when a MGMT of 35d of pre-calving ration is used. Further analyses on reproduction and total lactation milk and component yields are required to formulate adequate recommendations.

Table 1. DP groups according to MGMT

	CDP MGMT								
	≤42d	43-49d	50-56d	57-63d	64-70d	≥71d	se	P(DP)	P(Parity)
N	59	63	112	107	48	163			
DP, d	41.9^{a}	50.6^{ab}	58.2^{c}	65.1^{c}	69.5^{c}	105.8^{d}	3.9	0.01	0.2
ECM, kg/d	29.5	32.5	31.9	30.9	31.5	31.2	1.0	0.6	0.01
Ketosis,%	13.5^{a}	33.0^{ab}	31.5^{ab}	34.8^{ab}	33.4^{ab}	41.0^{b}	7.9	0.07	0.04
RP,%	27.6^{b}	16.1^{ab}	13.9^{ab}	13.2^{ab}	8.3^{a}	8.5^{a}	7.2	0.09	0.3
	SDP MGMT								
	≤28d	29-35d	36-42d	≥43d	se	P(DP)	P(Parity)		
N	100	132	106	74					
DP, d	22.3^{a}	31.8^{b}	38.3^{c}	56.9^{d}	1.7	0.01	0.5		
ECM, kg/d	29.8^{a}	31.8^{b}	32.5^{b}	31.5^{ab}	0.7	0.01	0.01		
Ketosis,%	7.8^{a}	25.3^{b}	15.6^{ab}	27.3^{b}	7.6	0.01	0.02		
RP,%	34.6^{b}	17.4^{a}	11.7^{a}	8.7^{a}	6.6	0.01	0.05		

Key Words: dairy cow, dry period length, transition

717 Effect of dietary phosphorus amount on milk production of dairy cows in China. Z. Liu[1], C. Wang*[1], J. X. Liu[1], D. M. Wang[1], and Z. Wu[2], [1]*Institute of Dairy Science, Zhejiang University*, *Hangzhou, 310029, P. R. China*, [2]*University of Pennsylvania, School of Veterinary Medicine*, *Kennett Square*.

The effect of reducing dietary phosphorus (P) on milk production of dairy cows in China was determined using 45 multiparous Holsteins over a full lactation period. Animals were blocked into 15 groups according to milk production of previous lactation and parity, and allocated to treatments randomly within each group. Diets contained 0.37, 0.47, or 0.57% P (DM basis), based on NRC guidelines, the level recommended by the Chinese feeding standard, and the amount currently fed by most producers, respectively. Milk yield was recorded and milk composition analyzed monthly. Blood samples were collected on d −6, −3, 0, 3, 6 relative to calving and then monthly throughout the experiment. Feces and urine were analyzed in wk 12, 24, and 36. All data were analyzed using the MIXED procedure of SAS software system with cow as the repeated subject using the covariance type AR (1). The model included phosphorus level, time, and interaction of phosphorus level × time. Neither DMI nor milk yield was affected by dietary P content (see Table 1). Milk fat was slightly higher for 0.37% P than for the other 2 dietary P concentrations. Serum P did not reflect dietary P amount, and there was no influence of dietary P on serum Ca concentration. Fecal P excretion was reduced by 25% when 0.37% P was fed compared with 0.57% P. Urinary P reached a maximum concentration for all groups during peak lactation. Reducing dietary P from 0.57 to 0.37% did not negatively affect milk production, while P excretion was significantly decreased.

Table 1. Milk performance and serum Ca and P pre- and post-partum influenced by dietary P amount in dairy cows

	Dietary P, %				
	0.37	0.47	0.57	SEM	P
Milk yield, kg/d	21.5	20.7	22.0	1.00	0.63
Milk fat, %	3.71	3.41	3.61	0.10	0.05
Milk protein, %	3.33	3.30	3.28	0.05	0.77
Serum Ca, mM					
Prepartum	2.05	2.06	2.06	0.27	0.92
Postpartum	2.03	2.04	2.00	0.13	0.87
Serum P, mM					
Prepartum	1.21	1.22	1.28	0.04	0.33
Postpartum	1.25	1.23	1.18	0.07	0.60

Key Words: dietary phosphorus amount, milk production, phosphorus excretion

718 Voluntary use of showers: Effects on behavior and physiology of dairy cattle in summer. A. L. Legrand[1,3], K. E. Schütz[2], and C. B. Tucker*[1], [1]*Department of Animal Science, University of California, Davis,* [2]*AgResearch Ltd, Hamilton, New Zealand,* [3]*Division of Animal Health & Welfare, University of Edinburgh, Roslin, UK*.

Water is often used to cool dairy cows in summer. There is limited evidence that cattle find water cooling aversive and may avoid wetting parts of the body, such as the head. Our objective was to understand whether dairy cattle will voluntarily use water located away from other resources, such as feed and lying areas, and if usage affects behavioral and physiological indicators of heat stress. Twenty-four dairy cows were used, half of which had access to a cow shower that consisted of a pressure-sensitive platform fitted with 2 shower heads; water flowed when the cow stepped on the platform. Internal body temperature and behavior were recorded 24h/d for 5d during summer, and respiration rate and skin temperature were recorded during the day. Cattle spent 3.0 ± 2.1h/d in the shower, and there was considerable variability between animals (0 to 5.8h/d). Cows preferentially used the shower during the daytime, with 89 ± 12% of use between 10:00–19:00h. Shower use increased with warmer weather by 0.3h for every 1°C increase in air temperature. Respiration rate and skin temperature did not differ between treatments (*t*-test; 53 ± 3.7 vs. 61 ± 4.3 breaths/min and 35.0 ± 0.3 vs. 35.4 ± 0.4°C in shower and control, respectively, $P \geq 0.16$). In contrast, cows provided with a shower had lower (*t*-test; 0.2 ± 0.1°C) body temperature than control cows in the evening ($P \leq 0.05$); peak body temperature occurred at this time. Weather affected cattle time budgets and physiological responses in both treatments, as assessed with regression. Cows spent less time lying when heat load index (HLI; a composite measure of air temperature, humidity, wind speed and solar radiation) increased ($P < 0.01$), but the total time spent lying, standing, and feeding did not differ between treatments (*t*-test; $P > 0.32$). Cows also had higher respiration rate, and skin and body temperature as HLI increased ($P < 0.01$), regardless of treatment. These data suggest that most cattle will make considerable use of water cooling in summer, and, as expected, this alleviated some of the effects of heat load in summer. There is, however, considerable individual variation in use of water and further work is required to understand the implications of these differences in a production setting.

Key Words: heat stress, behavior, physiology

719 The influence of technological and biological factors on productivity in dairy farms. A. H. Herlin*[1] and K. Bäckman[2], [1]*Dept. Rural Buildings, Swedish University of Agricultural Sciences, Alnarp, Sweden,* [2]*Estate Office, Swedish University of Agricultural Sciences, Uppsala, Sweden*.

There are many strategic decisions for the milk producer. The Swedish milk producers, as well as many others, have increased herd sizes and have increased use of technologies which mainly improve precision and/or are labor saving. The aim of this investigation was to explore how different biological or technological factors influence productivity in dairy farms. Eight dairy farms in southern Sweden were selected as they participated in economic extension service. Detailed economic results from book-keeping were used in the analysis together with data from milk recording scheme and data from enquiries. Different milking systems were also considered for the selection of farms. On farms, technical level were registered as milking systems and number of milking units, milking frequency, number of free-stalls and type of feeding systems. Biological factors as production level, calving age, calving interval, replacement rate and causes for replacement and health on herd level and calf mortality. Data was compiled in Excel and regression coefficients determined in Minitab. Herd sizes were 97 to 550 cows with an average of 266. Average milk production was 9775 kg (SD. 1640). Increasing herd size was associated, but not significantly, with lower production. Herds with herring bone or parallel milking systems had production of about 10 500 kg milk while the herds with robotic and carousel milking had a production of about 8500 kg. Milking frequency influenced only slightly production (R^2 24%; $P = 0.218$). Occupancy rate (cows per free-stalls) showed a positive relationship in milk per cow (R^2 40%; $P = 0.091$). Increasing herd size reduced working hours per cow ($P = 0.049$), but reduction was most evident below 260 cows per herd. Higher milk revenue minus feed costs was correlated with higher production levels. The complexity of milk production on the farm level makes it also difficult to fully acquire reliable empirical data for analysis in how different factors influence profitability. However, our data show that within the herd sizes investigated, work hours per cow and year is less likely to go below 26 h in herds larger than 260 cows but further studies have to confirm that.

Key Words: profitability, milk production

720 Management-driven heterogeneity in the relationship between milk production and reproductive performance of dairy cows. N. M. Bello*, J. P. Steibel, R. J. Erskine, and R. J. Tempelman, *Michigan State University, East Lansing*.

Although research on the relationship between milk production and reproduction of dairy cows has been extensive, many studies are conflicting. Much work is characterized by a common under-appreciation of the relative importance of the within-herd (cow-level) component versus the between-herd (herd-level) component of this relationship, and how these may depend upon herd management. We recently developed and validated a bivariate hierarchical Bayesian approach to model multifactorial sources of heterogeneity for these 2 components of variances and covariances. The objective of this study was to apply this methodology to evaluate various herd management factors as sources of potential heterogeneity on variances of and covariance between milk production and reproductive performance of Michigan dairy cows. Data consisted of 124,079 lactation records from 541 Michigan dairy farms. The means, variances, and covariances between cumulative milk yield at 305 DIM (305MILK) and calving interval (CI) were modeled as a function of management practices; significant herd management factors influencing the relationship between the 2 traits were selected using the Deviance Information Criterion. The production-reproduction relationship at the herd level was generally favorable with average herd CI estimated to

decrease 0.13 ± 0.06 d for every 100 kg increase in herd 305MILK. However, for within-herd relationships, higher producing cows had poorer reproductive performance (0.50 ± 0.03 d longer CI per 100 kg increase in 305MILK) than lower producing herdmates. This unfavorable relationship was, nevertheless, alleviated by ~12% in herds with a high level (>50% cows) of bST supplementation. Significant random herd-specific sources of heterogeneity in the magnitude of the cow-level production-reproduction relationship suggest further investigation of additional management practices. Understanding the conditions under which milk yield and fertility express different associations is critical to help guide management decisions to optimize dairy cow and herd performance at its dual production-reproduction core.

Key Words: dairy cow, production-reproduction relationship, management

721 Milking frequency and milk production in pasture-based lactating dairy cows. A. G. Rius*, J. K. Kay, C. V. C. Phyn, S. R. Morgan, and J. R. Roche, *DairyNZ*, *Hamilton, New Zealand*.

The objective of this study was to test the effect of modified milking frequency (MF) during early lactation on milk production in grazing dairy cattle. Multiparous Holstein-Friesian cows (n = 150) were randomly assigned to one of 5 treatments at parturition: milked once daily (1X) for 21 d (1X21), milked 1X for 42 d (1X42), milked twice daily (2X), milked thrice daily (3X) for 21 d (3X21), and milked 3X for 42 d (3X42). All cows were milked 2X post treatment until wk 24 in lactation. Animals were offered a generous allowance of fresh pasture and supplemented with 4 kg DM/d of concentrate during the first 16 wk in milk and 2 kg DM/d for 8 wk thereafter. Effects of MF, duration of MF, and interactions during treatment and post treatment periods were tested using mixed models (GenStat 12.1). During the treatment period, a MF x duration interaction was detected for milk, protein, and fat yields. Relative to 3X21, 3X42 failed to increase milk production further. However, 1X42 had lower ($P < 0.05$) milk (2.4 kg/d), protein (0.10 kg/d), and fat (0.12 kg/d) yields compared with 1X21 during the treatment period. Relative to 2X, 3X cows produced more milk (1.5 kg/d; $P < 0.05$), however, protein and fat yields were not different during or after the treatment period. There was no MF x duration interaction post treatment. An adverse effect in production occurred for 1X in the post treatment period; however, 3X cows failed to sustain increased production compared with 2X. Relative to 2X, 1X cows had lower yields of fat (0.1 kg/d; $P < 0.01$) and protein (0.05 kg/d; $P < 0.05$) post treatment. Body weights were reduced in 2X cows compared with 1X during the treatment (476 vs. 484 kg; $P < 0.05$) and post treatment periods (500 vs. 512 kg/d; $P < 0.01$). In summary, 1X for the first 21 or 42 DIM impaired milk production and the losses continued for the remainder of the lactation. Relative to 2X, 3X in early lactation did not improve milk production beyond the period of increased milking frequency.

Key Words: milking frequency, duration, milk production

722 Water use and effectiveness of a low pressure mister system for cooling lactating dairy cows during chronic heat stress. J. K. Bernard*[1], D. R. Bray[2], N. A. Mullis[1], and C. P. Rowe[1], [1]*University of Georgia*, *Tifton,* [2]*University of Florida*, *Gainesville*.

A replicated switchback design trial was conducted during June and July, 2009 to determine the effectiveness of a low pressure mister system for providing supplemental evaporative cooling compared with a high pressure mister system. Both mister systems were mounted to the face of 91.4 cm high speed fans spaced every 18.3 m over the feed alley and free stalls in a 4-row free stall barn. The low pressure mister system (Arato Dairy Cooling System, Aratowerk GmbH & Co. KG, Germany) operated at an average line pressure of 3.4 bar (50 psi) whereas the high pressure system operated at an average line pressure of 12.4 bar (180 psi). The fans were set to operate when the ambient temperature inside the barn exceeded 22.2 C (72 F) and the mister systems operated anytime the fans were on and the relative humidity was less than 85%. Conditions within the free stall barn were continuously monitored using a Hobo ProRH/Temp data logger. Each replicate of the trial consisted of 3 wk and there were 2 replicates. For each replicate, the body temperature of 10 lactating Holstein cows each in 2 groups was continuously recorded every 5 min for 3 d using a water probe placed in the vagina each wk. Water usage for each system was measured during the second replicate using inline water meters. Environmental conditions inside the free stall barn were characteristic of chronic heat stress in that the temperature-humidity index was greater than 72 throughout the trial. The body temperature of the cows cooled with the low pressure and high pressure systems were similar ($P = 0.69$) and averaged 38.794 and 38.789 C (101.83 and 101.82 F), respectively. No differences ($P = 0.58$) were observed in respiration rates of cows which averaged 61.0 and 62.5 breaths per min for low pressure and high pressure systems, respectively. The low pressure mister system used 43% less water per day than the high pressure system. Results of this trial indicate that a low pressure mister system that uses less water can be used to provide supplemental cooling of lactating dairy cows housed in a free stall barn during chronic heat stress conditions.

Key Words: heat stress, evaporative cooling, dairy cows

723 A point-in-time comparison of the environmental impact of Jersey vs. Holstein milk production. J. L. Capper*[1] and R. A. Cady[2], [1]*Department of Animal Sciences, Washington State University*, *Pullman,* [2]*Elanco Animal Health*, *Greenfield, IN*.

This study investigated the environmental impact of producing 500,000 MT of cheddar cheese using either Jersey or Holstein cow populations. The model used current DRMS DairyMetrics population data for milk yield and composition (Jersey: 20.9 kg/d, 4.8% fat, 3.7% protein; Holstein: 29.1 kg/d, 3.8% fat, 3.1% protein), age at first calving, calving interval, and culling rate. Each population contained lactating and dry cows, bulls and herd replacements for which rations were formulated according to NRC at breed-appropriate bodyweights. Resource inputs included feedstuffs, water, land, fertilizers and fossil fuels. Waste outputs included manure and greenhouse gas emissions. Cheese yield (kg) was calculated according to Van Slyke (1949). Increased daily milk yield in Holstein cows reduced the population size required to produce 500,000 MT of cheese by 8.5%. The potential magnitude of the difference in population size was mitigated by the earlier age at first calving and shorter calving interval of Jersey cows, which reduced replacement heifer and dry cow numbers respectively. Despite the increase in total animal numbers, decreased bodyweight of individual Jersey animals reduced the total body mass of the Jersey population. In consequence, maintenance energy was reduced by 21%, water use by 27% and cropland use by 23% per unit of cheese. Fossil fuel use was reduced by 21% per unit of cheese made using milk from the Jersey population. Methane and nitrous oxide emissions associated with cheese produced by the Jersey population were reduced by 18% and 7.1% respectively. The carbon footprint (total CO_2-equivalents) was reduced by 18% per unit of cheese in Jerseys compared with Holsteins. Results demonstrate that reductions in environmental impact conferred by the 'dilution of maintenance' effect are not simply mandated by changes in milk pro-

duction, but are also markedly affected by the interplay between animal bodyweight and nutrient density of milk.

Key Words: environmental impact, carbon footprint, dilution of maintenance

724 Bio-economic value of extended lactations in Italian Holstein farms. A. S. Atzori*, R. Steri, C Dimauro, A. Cannas, and G. Pulina, *Dipartimento di Scienze Zootecniche, University of Sassari*, *Sassari, Sardinia, Italy*.

The extension of lactations over the standard 305 DIM might be suitable due to the low feeding cost in late lactation and the negative effect of pregnancy on milk yield. About 50% of the > 1,000,000 heads of Italian Holstein cows (about 9000 kg of milk/y per cow) became pregnant after 143 DIM and had a mean calving interval (CI) > 450 d. Farmers usually try to inseminate the cows as early as possible to achieve a short CI to maximize daily milk yield. Unfortunately, higher milk yields tend to reduce cow fertility in early lactation due to genetic and management constraints, reducing the economic benefit of the farm plan. A bio-economic model was developed in Excel to assess possible advantages of extended lactations. The model accounted for feeding, reproductive, milking, culling and replacement costs, based on data from farm surveys or Italian literature if needed. Total feeding costs, expressed as cost of total energy requirements at each lactation stage, were calculated per energy unit (€/Mcal) and decreased from early lactation to dry (<120, 120–250, > 250 DIM and dry). Income came from the selling of milk and live animals. The model assumed a fixed number of lactations per productive life, which increases proportionally to CI. The annual gain per cow when first insemination was delayed, voluntarily or not, from 85 to 285 DIM was calculated. To quantify the effect of pregnancy on milk yield, the estimates of Genizi et al. (1992) were used. The model showed that: 1) the annual gain per cow increased by 6.7% as lactation length increased voluntarily from 305 to 385 DIM and then decreased due to higher culling and cost of Mcal in short lactations; 2) the annual cow gain was reduced, due to infertility costs, by 2.9% and 5.6% for lactation of 385 and 505 DIM, respectively, in relation to voluntarily delayed insemination. The application of this model indicated the need for testing it in a wide range of dairy farms taking into account the milk yield level, to ascertain the effect of peak of lactation on economic results.

Key Words: extended lactation, economic value, model

725 Physiological and nutritional changes of dairy goats for maintaining milk yield during extreme heat stress conditions at late lactation. S. Hamzaoui, A. A. K. Salama*, G. Caja, E. Albanell, C. Flores, and X. Such, *Universitat Autònoma de Barcelona*, *Bellaterra, Barcelona, Spain*.

Eight Murciano-Granadina dairy goats (43.5 ± 2.6 kg BW; 194 ± 3 DIM) kept in metabolic cages were allocated in 2 balanced groups and randomly assigned to 2 climatic treatments according to a crossover design (35 d periods). Treatments were (temperature, °C; humidity, %; THI, Thorn heat index):1) thermal neutral (TN, 15 to 20°C and 35 to 45%; THI = 59 to 64), and 2) heat stress (HS, 12 h/d at 37°C and 40%, and 12 h/d at 30.5°C and 40%, THI = 85 and 77, respectively). Goats were fed daily 0.8 kg concentrate, 0.65 kg alfalfa pellets, and dehydrated fescue ad libitum. Concentrate was adjusted daily to maintain constant the forage:concentrate ratio. Feed and water intake, milk yield, and rectal temperature and respiration rate at 8, 12 and 17 h were recorded daily. Milk and blood samples were collected weekly. Blood samples for acid-base balance indicators (d 25), as well as feces and urine for digestibility and N balance (d 31 to 35) were also collected in each period. Rectal temperature (38.7 vs. 39.2°C), respiration rate (34 vs. 82 per min), water intake (5.5 vs 11.1 L/d) and evaporation (1.1 vs. 3.3 L/d), were greater in HS ($P < 0.001$) than in TN, while feed intake (2.0 vs. 1.6 kg/d) was lower ($P < 0.001$). Blood NEFA (37 vs.12 mmol/L) and haptoglobin (0.134 vs. 0.105 ng/mL) were greater ($P < 0.05$) in HS than TN only at d 7. Despite the lower feed intake of HS goats, milk yield (1.23 L/d) did not vary, but milk of HS goats contained less ($P < 0.05$) protein (3.36 vs. 3.84%) and casein (2.84 vs. 3.21%) than TN goats. Panting decreased blood CO_2 (21.9 vs. 25.7 mmol/L; $P < 0.01$) in HS goats, but they maintained blood pH at a similar value to TN goats by lowering HCO_3^- (20.9 vs. 24.6 mmol/L; $P < 0.01$) and increasing Cl^- (109 vs. 107; $P < 0.05$) in blood. Digestibility of DM, OM, and ADF tended ($P < 0.15$) to be greater in HS goats, which partially compensated for the reduction in feed intake. In conclusion, late lactating dairy goats were able to adapt to severe heat stress conditions maintaining milk yield but with reduced milk protein content.

Key Words: heat stress, dairy goat, nutrition

726 Impact of evaporative pads and cross ventilation on core body temperature and resting time of lactating cows. J. F. Smith[1], B. J. Bradford*[1], J. P. Harner[1], K. Ito[2], M. vonKeyserlingk[2], C. R. Mullins[1], J. C. Potts[1], and M. W. Overton[3], [1]*Kansas State University*, *Manhattan*, [2]*University of British Columbia*, *Vancouver, Canada*, [3]*University of Georgia*, *Athens*.

A trial was conducted to determine the impact of evaporative pads (EP) on core body temperature (CBT), time spent lying and number of lying bouts of Holstein cows housed in cross ventilated freestall facilities. Two facilities were used; 1 with EP and 1 without evaporative pads (NP). Each facility had 4 pens, 1 baffle/pen and a nominal width of 122 m. Cows (n = 143) were fit with data loggers (HOBO Pendent G) to determine resting activity and 87 cows were fit with data loggers (HOBO U12) attached to blank CIDRs to determine CBT every 5 min. Ambient conditions were collected every 15 min on both sites. Individual cow CBT and activity data (9 d/cow) were analyzed to determine the amount of time CBT was above 38.9 and 39.2°C, time spent lying, and lying bouts/d. These variables were analyzed using pen as the experimental unit, with cow and day as random effects. Parity, reproductive status, and days in milk were tested as covariates in each model but removed if they did not contribute significantly to the prediction equation. Average maximum temperatures were 25°C. Lying times and lying bouts were similar for both treatments; means for lying time and bouts were 666 min/d and 12.0/d for EP and 654 min/d and 12.9/d for NP. CBT was above 38.9°C for 566.3 and 704.5 min/d for EP and NP, respectively ($P = 0.06$), and above 39.2°C per day for 321 and 378 min/d for EP and NP ($P = 0.06$). Despite the cool ambient conditions, cows in NP tended to have CBT above 38.9°C for 2.3 more h/d and CBT above 39.2°C for 1.0 more h/d. These trends were evident even though the stocking density of the freestalls in EP was higher than NP (123.4% vs. 113.1%). These results indicate that CBT tends to be reduced even under relatively mild ambient conditions when EP are used in cross ventilated facilities.

Key Words: heat stress, lying behavior, evaporative cooling