

## POSTER PRESENTATIONS

### Animal Behavior and Well-Being: Livestock

**M1 Rubber flooring impact on health of dairy cows.** S. D. Eicher<sup>\*1</sup>, D. C. Lay Jr.<sup>1</sup>, J. D. Arthington<sup>2</sup>, and M. M. Schutz<sup>3</sup>, <sup>1</sup>USDA-ARS, West Lafayette, IN, <sup>2</sup>University of Florida, Ona, <sup>3</sup>Purdue University, West Lafayette, IN.

Rubber flooring in dairies has become popular because of perceived cow comfort. The objective of this longitudinal study was to evaluate locomotion, stress, and immunity over the first 180d of each of the 1st and 2nd lactations of cows assigned to free-stall housing with either rubber (RUB) or concrete (CON) at the feed-alley of their housing. Cows entered the experiment at d -60 before 1st (n = 30) lactation and were observed over 2 lactations. Between lactations cows remained in a straw bedded-pack dry-cow pen. Locomotion scores and blood samples were obtained at approximately -60, -30, 0, +7 and weekly through d +189 relative to calving throughout 2 lactations. Data were analyzed as a completely randomized design with repeated measures. Chi Square analysis was used to evaluate hoof pathologies. Cortisol responses were only affected by d ( $P = 0.05$ ). White blood cell (WBC) counts increased for CON cows compared with RUB cows after d 63 through 182. WBC counts returned to similar counts of RUB cows over the dry period, but quickly became greater than those of CON cows after parturition (9.0, 9.5, and 7.8, and 11.0, 8.8, and  $13.0 \times 10^6$  cells/mL for RUB and CON cows at d 142, parturition, and d 142 of 2nd lactation; treatment by d interaction,  $P < 0.01$ ). Neutrophil counts only tended to be affected by d ( $P = 0.10$ ) and a weak trend ( $P = 0.13$ ) for a treatment by d interaction was detected. Lymphocyte counts followed the pattern of WBC counts, but only had a trend ( $P = 0.08$ ) for a treatment by d effect (4.9, 5.1, and 5.3, and 6.8, 5.1, and  $8.4 \times 10^6$  cells/mL for RUB and CON cows at d 142, parturition, and d 142 of 2nd lactation; treatment by d interaction,  $P < 0.01$ ). Monocytes counts were not affected by treatment or time ( $P > 0.10$ ). Haptoglobin (treatment by d interaction,  $P = 0.15$ ) and ceruloplasmin (week effect,  $P = 0.08$ ) were not affected by treatment. Hoof pathology was different by number of treatments that were required (RUB = 2.1 and CON = 1.4;  $P = 0.03$ ). Lameness and sound classifications were not different between treatments ( $P = 0.13$ ). These data show that flooring affected cow hoof and leg health and altered immune cell counts, which may indicate an underlying chronic inflammation.

**Key Words:** innate immunity, rubber flooring, stress

**M2 Rubber flooring impact on production and herd life of dairy cows.** M. M. Schutz<sup>\*1</sup> and S. D. Eicher<sup>2</sup>, <sup>1</sup>Purdue University, West Lafayette, IN, <sup>2</sup>USDA-ARS, West Lafayette, IN.

Use of rubber flooring in dairies has become popular because of perceived cow comfort. The overall objective of this longitudinal study was to evaluate production, reproduction, and retention of first and second lactations of cows assigned to either rubber (RUB) or concrete (CON) flooring at the feed alley. Feeding system included headlocks; and cows were fed once daily, with feed pushed up 5 times daily. Grooved concrete cow alleys provided access to 2 rows of free stalls in each pen. Cows entered the experiment at d -60 before 1st (n = 13 for CON and n = 17 for RUB) lactation and were observed over 2 lactations. Between lacta-

tions cows remained in a straw bedded-pack dry-cow pen. Production and health data were recorded throughout both lactations. Date left was recorded for each cow or considered to be 4 years after first calving for cows still in the herd. Milk, fat, and protein; somatic cell scores (SCS); and numbers of days open and inseminations were analyzed as linear models using Proc Mixed of SAS. Explanatory variables in models included fixed effects of treatment, age and year-season of calving, and number of days open. Days from calving to exiting the herd were analyzed separately by parity. RUB increased mature equivalent (ME) fat (488 vs 432 kg), ME protein (364 vs 326 kg), and protein % (2.99 vs 2.81%) and persistency of the milk lactation curve (114 vs 106%) ( $P < 0.04$ ) and tended to increase fat % (4.02 vs 3.70%) ( $P < 0.10$ ) in first parity. However, for second parity, CON increased ME fat (524 vs 432 kg) ( $P < 0.04$ ) and tended to increase fat % (3.95 vs 3.49%) ( $P < 0.08$ ). Treatment did not affect days of herd life from first calving, but those cows calving a second time tended to remain in the herd more days after second calving on CON (660 vs 368 d) ( $P < 0.08$ ). Treatment by parity interactions were confirmed in repeated records analyses. These data indicate that flooring can influence production and herd life. Rubber flooring for cow comfort may not be justified solely in terms of yields and herd life.

**Key Words:** housing, production, rubber flooring

**M3 Motivation to walk affects speed but not gait score in dairy cattle.** A. K. Barrientos<sup>\*</sup>, M. A. G. von Keyserlingk, and D. M. Weary, University of British Columbia, Vancouver, Canada.

Gait scoring systems have been developed as a tool to improve early detection and treatment of lameness; however, a variety of confounding factors including motivation to walk toward an attractive resource (such as fresh feed) may affect the way cows walk. Our aim was to vary motivation to walk (by providing a food reward) testing the prediction that increased motivation will a) increase walking speed and b) reduce gait score (i.e., make lame cows appear sound). Eleven cows, scored for presence and severity of hoof lesions and balanced for lameness, were trained to walk individually down a 16 m test alley. Cows received 4 training sessions per day; during each session cows were randomly assigned to either receive a food reward (from a feed bin visible from the end of the alley) or not. After 5 d of training cows were tested using the same procedure. Walking speed (m/s) was recorded electronically using light sensors. Gait was scored using a 1-to-5 numerical rating system (NRS; 1 = sound, 5 = severely lame) and a continuous 100-unit visual analog scale (VAS) of 6 gait attributes (back arch, head bob, tracking-up, joint flexion, asymmetric steps, and reluctance to bear weight). Cows walked faster when they were given a reward than when they were not rewarded ( $1.22 \pm 0.02$  m/s vs.  $1.01 \pm 0.02$  m/s,  $P < 0.001$ ). This increase in walking speed tended to be lower for cows with sole ulcers, interdigital hyperplasia or both than for cows without these conditions ( $0.16 \pm 0.04$  m/s vs.  $0.28 \pm 0.05$  m/s,  $P = 0.08$ ). Provision of a reward had no effect on NRS ( $3.26 \pm 0.04$  vs.  $3.34 \pm 0.04$ ,  $P = 0.20$ ). However, the food reward affected certain gait characteristics; cows had greater back arch ( $54 \pm 1$  vs.  $50 \pm 1$ ,  $P = 0.01$ ), but better tracking up ( $44 \pm 3$

vs.  $53 \pm 3$ ,  $P = 0.05$ ), when provided a food reward. These results show that motivation to walk affects walking speed and gait attributes likely affected by speed (back arch and tracking up), but that overall gait score remains consistent.

**Key Words:** lameness, locomotion, reliability

**M4 Resting patterns of dairy cows and housing characteristics.** A. Bach\*<sup>1,2</sup> and I. Guasch<sup>1</sup>, <sup>1</sup>*Department of Ruminant Production, IRTA, Caldes de Montbui, Spain*, <sup>2</sup>*ICREA, Barcelona, Spain*.

One hundred and 41 lactating Holstein cows (milk yield =  $37.1 \pm 7.6$  kg/d, DIM =  $136 \pm 67$  d) wearing a pedometer able to record daily number of lying bouts and lying time were monitored for a period of 6 mo to evaluate whether resting behavior was affected by the characteristics of different pens within a farm. Cows were distributed in 8 different pens holding an average of  $67 \pm 14$  cows with about 25% of the cows in each pen wearing a pedometer. All cows received the same ration and were milked 3 times daily. Average ratios of stalls and feedbunk per cow were  $1.0 \pm 0.22$  and  $1.12 \pm 0.17$ , respectively. Average distance from the neck rail to end of the stall was  $186 \pm 12.2$  cm, and the diagonal from the top of the neck rail to rear of the stall was  $226 \pm 7.3$  cm. Stall design was not confounded with DIM, as several pens with different stall designs had the same number of DIM. Resting activities were averaged within pen, and a weighted regression analysis (including the proportion of animals wearing a pedometer in each pen as a weighting variable) with DIM as a covariate was used to determine associations between different housing parameters and lying time across pens. Average resting time was  $11.4 \pm 0.98$  h/d distributed in  $15.5 \pm 2.2$  bouts/d. Lying time tended ( $P < 0.10$ ) to be positively correlated with DIM. The numbers of stalls and feed bunk spaces per cow were positively correlated ( $r = 0.98$  and  $0.74$ , respectively) with resting time. The distance between the neck rail and the end of the stall and the diagonal from the top of the neck rail to the end of the stall were also positively correlated ( $r = 0.69$  and  $0.72$ , respectively) with lying time. Stall curb height was negatively correlated ( $r = -0.87$ ) with lying. Cows lying on stalls with 25 cm or lower curb heights (50% of the pens) rested for  $12.3 \pm 0.67$  h/d and those on stalls with curb heights above 25 cm rested  $10.3 \pm 0.33$  h/d. Providing sufficient number of stalls and feedbunk space should improve lying time. In addition, when designing stalls, an attempt should be made to minimizing curb height and maximizing the diagonal between the end of the top of the neck rail and the rear end of the cubicle.

**Key Words:** behavior, lying, housing

**M5 Short-term overcrowding did not affect the feed intake, hygiene, or stress response of Holstein dairy cows.** P. D. Krawczel\*<sup>1,2</sup>, L. B. Klaiber<sup>1</sup>, R. E. Butzler<sup>1</sup>, L. M. Klaiber<sup>1</sup>, M. P. Carter<sup>1</sup>, H. M. Dann<sup>1</sup>, C. S. Mooney<sup>1</sup>, and R. J. Grant<sup>1</sup>, <sup>1</sup>*William H. Miner Agricultural Research Institute, Chazy, NY*, <sup>2</sup>*The University of Vermont, Department of Animal Science, Burlington*.

Access to feeding and resting resources is critical to the welfare of dairy cows. The objective of this study was to determine whether housing Holstein dairy cows at stocking densities of 100 (1 cow per stall and headlock), 113, 131, and 142% would affect the well-being (assessed from dry matter intake (DMI), fecal cortisol metabolites and udder and leg hygiene). Multiparous cows ( $n = 96$ ) and primiparous cows ( $n = 40$ ) were assigned to 1 of 4 pens (34 cows per pen) in a 4-row freestall

barn. Pens were balanced for parity, milk production, days in milk, and somatic cell count. Treatments were imposed for 14 d using a  $4 \times 4$  Latin square design. DMI was assessed at the pen-level over the final 3 d of each period. Fecal cortisol metabolites were measured from samples collected from the focal cows ( $n = 12$ ) in each pen on d 13 and d 14 of each period. Udder and leg hygiene was assessed using a scale of 1-to-4 on the focal cows, who were groomed on d 1 of each period and scored on d 14. Data were analyzed using MIXED procedure of SAS. DMI ( $26.4 \pm 0.6$  kg/d) was unaffected by treatment ( $P > 0.10$ ). Cortisol metabolites ( $3.2 \pm 0.2$  ng/g;  $P = 0.21$ ) and udder hygiene score ( $1.8 \pm 0.1$ ;  $P = 0.99$ ) did not differ among treatments. Leg hygiene scores differed between 131 ( $2.5 \pm 0.2$ ) and 142% ( $2.8 \pm 0.2$ ;  $P = 0.03$ ). The mean score when housed at 100 and 113% ( $2.6 \pm 0.2$ ) indicated this observed difference was not biologically meaningful. Overall, the results suggest that well-being, as defined within this experiment, was not affected by short-term overcrowding. However, further research is needed to determine if the same responses are observed over longer durations.

**Key Words:** dairy cow, overcrowding, well-being

**M6 Greater feed bin stocking density increases the social aggression of postpartum dairy cows.** P. D. Krawczel\*<sup>1,2</sup>, D. M. Weary<sup>3</sup>, R. J. Grant<sup>1</sup>, and M. A. G. von Keyserlingk<sup>3</sup>, <sup>1</sup>*William H. Miner Agricultural Research Institute, Chazy, NY*, <sup>2</sup>*The University of Vermont, Department of Animal Science, Burlington*, <sup>3</sup>*Animal Welfare Program, University of British Columbia, Vancouver, BC, Canada*.

Beyond dry matter intake, feed bunk management practices that affect feeding-related behaviors may influence the welfare of postpartum dairy cows. The objective of this study was to determine the effects of feed bin stocking densities of 100% (1:1, bin:cow), 133% (1: 1.33), 150% (1:1.5), and 200% (1:2) on the feeding and social behavior of dairy cows during the 3 wk after parturition. Two groups of multiparous, Holstein cows ( $n = 24$ ) with no clinical illness were housed sequentially in a pen containing 36 freestalls (freestall stocking density was 67%) and 18 feed bins. The pen was managed as a dynamic group to keep stocking density constant. Daily visits to the feed bin were recorded by an electronic feeding system. Meals and total meal time (defined as time feeding from bin plus time of within meal intervals) were calculated from the bimodal distribution of the frequency of the intervals between visits to the feed bins. Social behavior was defined as the number of successful displacements from the feed bin. Displacements were recorded for 3 h following 6 consecutive deliveries of a total mix ration during wk 2 of each cow's lactation. Data were analyzed as a randomized design using the mixed procedure of SAS. The model included week as the repeated measure for feeding behavior. Feed bin visits decreased after wk 1 ( $P < 0.001$ ) and a treatment by week interaction was evident ( $P = 0.03$ ). Meals decreased (from  $8.4 \pm 0.2$  to  $7.5 \pm 0.2$  per day;  $P < 0.001$ ) and total meal time increased (from  $3.8 \pm 0.1$  to  $4.9 \pm 0.1$  h/d;  $P < 0.001$ ) from wk 1 to wk 3, but were not affected by treatment ( $P > 0.80$ ) or treatment by day interaction ( $P > 0.10$ ). At 200%, cows initiated more displacements ( $P < 0.03$ ) and were involved in a greater total number of interactions ( $P \leq 0.05$ ) than the other treatments, but were only displaced more ( $P = 0.04$ ) than the 100% cows. These results are consistent with earlier work on transition cows showing increased aggressive interactions with overcrowding. Future work should consider the role of freestall overcrowding or clinical illness on the response to feed bunk competition.

**Key Words:** dairy cow, behavior, competition

**M7 Lying and standing behavior on farms using deep-bedded versus mattress freestalls.** K. Ito\*, M. A. G. von Keyserlingk, and D. M. Weary, *University of British Columbia, Vancouver, BC, Canada.*

Freestall dairy herds using mattresses experience a higher prevalence of lameness than do herds using deep-bedded stalls. This difference may be due to reduced comfort of mattresses as a lying surface, but the effects of mattresses on lying and standing behaviors are not well understood. The aim of this study was to compare lying and standing behavior on commercial farms using mattresses with minimal bedding (MAT;  $n = 17$ ) versus those using deep-bedded stalls with sand or sawdust bedding (DB;  $n = 12$ ). We have previously reported lameness prevalence for these 29 freestall herds: 10.3% severe lameness (score  $\geq 4$  on a 5-point gait scoring system) on MAT farms versus 4.6% on DB farms. Using electronic data loggers attached to the hind leg, lying behavior of 48  $\pm 2$  focal cows/farm were recorded at 1-min intervals for 5 d, from which mean lying time (h/d) and the SD of lying time (h/d) among cows within farm were calculated. Numbers of cows that were standing fully inside stall, perching with only 2 feet inside stall, lying down in stall, and feeding were counted on each farm during one farm visit 2 h before afternoon milking. Stall Standing Index (SSI) was calculated as the percentage of cows in the pen not feeding that are standing or perching in the freestall. Effect of stall base on each behavioral variable was tested using a *t*-test. Lying time averaged  $11.0 \pm 0.7$  (mean  $\pm$  SD) h/d, and did not differ with stall base ( $P = 0.5$ ). However, the variation (SD) in lying time was greater on MAT farms compared with DB farms ( $2.1 \pm 0.07$  h/d vs.  $1.8 \pm 0.08$  h/d, respectively,  $P = 0.005$ ). SSI at the time of assessment was  $21.6 \pm 1.9\%$  on MAT farms compared with  $12.0 \pm 1.2\%$  on DB farms ( $P < 0.001$ ). In summary, farms using mattresses have more variable lying times, and cows on these farms spend more time standing and perching in the freestall.

**Key Words:** lameness, cow comfort, stall design

**M8 Limit-feeding dairy heifers: Effects of feed bunk space and provision of a low nutritive feedstuff.** K. Stevenson, B. L. Kitts, A. M. Greter, and T. J. DeVries\*, *Dept. Animal and Poultry Science, University of Guelph, Kemptville Campus, Kemptville, ON, Canada.*

The objective of this study was to examine the effects of feed bunk space and provision of a low nutritive feedstuff on the behavior of limit-fed dairy heifers. Twelve Holstein dairy heifers ( $391.1 \pm 44.8$  d of age;  $415.4 \pm 47.2$  kg), divided in groups of 3, were exposed to each of 3 treatments in a Latin square design with 7-d periods. The treatments were: 1) 0.68m of feed bunk space/heifer (TMR-0.68), 2) 0.34m of feed bunk space/heifer (TMR-0.34), and 3) 0.34m of feed bunk space/heifer with straw (up to 2kg/animal/d) provided (TMR-S). All heifers were fed a TMR at a restricted level (1.9% of BW), which contained (DM basis) 19.9% haylage, 20.1% corn silage, 49.6% high moisture corn, and 10.4% protein supplement. Group DMI was recorded daily. Feeding behavior and displacements from the feed bunk were recorded for the last 4 d of each period. Data were analyzed in a general linear mixed model. Heifers consumed more DM on the TMR-S treatment provided compared with the TMR-0.68 and TMR-0.34 treatments ( $9.4$  vs  $7.8$ kg/d; SE = 0.07,  $P = 0.001$ ). Feeding time was also longer on the TMR-S treatment (147.7 min/d) compared with the TMR-0.68 and TMR-0.34 treatments ( $64.5$  min/d; SE = 5.5;  $P = 0.005$ ). Within the TMR-S treatment, feeding time on straw was 80.4 min/d, thus the rate of consumption of only the TMR was similar across all treatments. During the first 90 min following feed delivery, when all TMR consumption occurred, very little time ( $4.0 \pm 1.6$  min) was spent consuming straw on the TMR-S treatment. During that 90-min time period, the frequency of displacements from the feed bunk was similar (SE = 2.4;  $P = 0.5$ ) between the TMR-0.68 (13.0),

TMR-0.34 (13.2), and TMR-S (15.1) treatments. For the TMR-S treatment, heifers displaced each other 8.7 times per day during the rest of the day while consuming straw. As result, there was more competition at the feed bunk on the TMR-S treatment over the course of the day as compared with the other treatments (23.8 vs. 13.1; SE = 2.9;  $P = 0.05$ ). The results suggest that neither increased feed bunk space, nor provision of a low nutritive feedstuff, will reduce competition for, or slow consumption rates of, a limit-fed TMR.

**Key Words:** limit-feeding, dairy heifer, feed bunk space

**M9 Effect of feed type exposure on diet selection behavior of dairy calves.** E. K. Miller-Cushon\* and T. J. DeVries, *Dept. of Animal and Poultry Science, University of Guelph, Kemptville Campus, Kemptville, ON, Canada.*

Dairy cattle exhibit characteristic feeding behavior patterns which may be influenced by early experiences. The objective of this study was to determine how early exposure to different feed types affects diet selection behavior (sorting) of dairy calves once fed a mixed ration. Eight Holstein bull calves were randomly assigned at birth to a feed exposure treatment: 1) concentrate (CONC) or 2) hay (HAY), offered ad libitum. All calves received 8L/d of milk, incrementally reduced after 4 weeks to enable weaning by the end of wk 7. After milk weaning, all calves were fed a mixed ration containing 60% concentrate and 40% chopped hay (as is basis) for 9 weeks. Intake was recorded and calves were weighed 3x/week. Daily samples of fresh feed and orts from each calf were taken biweekly to determine dry matter intake (DMI), and duplicate samples were taken on wk 8, 12, and 16 for particle size analysis. The separator had 3 screens (19, 8, and 1.18mm), producing long, medium, short, and fine particle fractions. Sorting of each fraction was calculated as actual intake as a percentage of predicted intake. Sorting values  $>100\%$  indicate sorting for, while values  $<100\%$  indicate sorting against. Data were analyzed using a repeated measures mixed model. CONC calves tended to have higher DMI than HAY both pre-weaning ( $0.49$  vs.  $0.16$ kg/d; SE = 0.12;  $P = 0.09$ ) and post-weaning ( $3.3$  vs.  $2.6$  kg/d; SE = 0.21;  $P = 0.06$ ). Pre-weaning weights were similar ( $P = 0.4$ ) but CONC calves had higher weights post-weaning ( $118.1$  vs.  $104.6$  kg; SE = 4.0;  $P = 0.05$ ). Initially after weaning, calves sorted for familiar feed; CONC calves sorted for short particles ( $126.4 \pm 4.6\%$ ;  $P < 0.01$ ), which were mainly concentrate, while HAY did not ( $94.2 \pm 8.5\%$ ;  $P = 0.3$ ). HAY calves tended to sort for long particles ( $113.4 \pm 10.6\%$ ;  $P = 0.08$ ), which were solely hay, while CONC calves sorted against them ( $56.4 \pm 12.6\%$ ;  $P < 0.01$ ). By wk 12, sorting was similar between treatments ( $P > 0.15$ ), with both CONC and HAY calves sorting ( $P < 0.01$ ) for short ( $117.4 \pm 3.0$ ,  $120.5 \pm 2.7\%$ ) and against long particles ( $62.4 \pm 6.8$ ,  $54.4 \pm 4.9\%$ ). The results indicated that feed familiarity affected initial diet selection post-weaning, but did not have any lasting effect.

**Key Words:** feed selection, dairy calves

**M10 Lying time and animal activity after surgical castration of Holstein bulls recorded with pedometers.** S. Marti\*<sup>1</sup>, M. Devant<sup>1</sup>, and A. Bach<sup>1,2</sup>, <sup>1</sup>*Department of Ruminant Production, IRTA, Barcelona, Spain,* <sup>2</sup>*ICREA, Barcelona, Spain.*

The aim of this study was to evaluate the effect of surgical castration on lying time and animal activity. A pedometer was placed in the left hind leg of 86 animals (27 bulls, 29 steers castrated at 3 mo of age, and 30 bulls castrated at 8 mo of age during the study) randomly chosen from a total of 132 animals (initial age =  $232 \pm 4.4$  d). Animals were allocated in 6 pens (2 pens for each treatment). The study started 5 d before bulls were surgically castrated and finished 10 d after. Each pen had one

computerized concentrate feeder (GEA Surge Westfalia, Germany), one straw feeder, and one drinker. Animals received concentrate and straw *ad libitum*. Daily lying time and average number of steps per hour were automatically recorded using a pedometer (E.N.G.S. Systems, Almagor, Israel). The statistical model included gender, day and their 2-way interaction, as fixed effects, and pen as a random effect. An interaction ( $P < 0.05$ ) was observed between treatment and day in lying time. From castration day until 5 d later, surgically castrated bulls spent a lesser amount of time lying ( $10.1 \pm 1.88$  h) than bulls and steers ( $12.7 \pm 0.65$  h and  $13.2 \pm 0.89$  h, respectively). Steers activity ( $48 \pm 5.0$  steps/h) was 54% lesser ( $P < 0.01$ ) than that of bulls ( $106 \pm 5.0$  steps/h). Activity was also affected ( $P < 0.001$ ) by an interaction between treatment and day. Bulls castrated at 8 mo of age showed a reduced activity above the first 3 d after castration ( $69 \pm 5.5$  steps/h) being lesser than that of bulls ( $109 \pm 22.7$  steps/h) but greater than that of steers castrated at 3 mo of age ( $43 \pm 6.2$  steps/h). Lying time is reduced during the 5 d following surgical castration. Bulls are more active (steps/h) than steers, and activity of steers decreases immediately after castration and for at least 10 d after castration remains lesser than that of bulls.

**Key Words:** beef, behavior, pedometers

**M11 Dairy cattle welfare assessment in 25 farms in southern Brazil.** G. B. Bond\*<sup>1</sup>, A. Ostrensky<sup>2</sup>, R. Almeida<sup>1</sup>, and C. F. M. Molento<sup>1</sup>, <sup>1</sup>Universidade Federal do Paraná, Curitiba, PR, Brazil, <sup>2</sup>Pontifícia Universidade Católica do Paraná, Curitiba, PR, Brazil.

The objective of this study was to assess the main welfare indicators for lactating cows in 25 dairy farms in southern Brazil. The participating farms used confined or semi-confined systems, and had a median of 164 (min. 78, max. 480) lactating Holstein cows with a mean daily production of  $28.5 \pm 4.1$  kg/cow. The visits occurred during the morning or afternoon milking, when a sample of 20% of the lactating cows was selected for locomotion scoring for locomotion scoring (0-good, 1-imperfect, 2-impaired, 3-severely impaired). After milking, other sample of 20% of the lactating cows was selected at the free stall. The animals were then observed for claw overgrowth (0 = normal, 1 = mildly overgrown, 2 = severely overgrown), hock lesions (0 = healthy, 1 = hair loss, 2 = abrasion), hock swelling (0 = healthy, 1 = mildly swollen, 2 = severely swollen) and hygiene score (1 = clean, 2 = slight manure splashes, 3 = demarcated plaques of manure, 4 = confluent plaques of manure). The data was analyzed through descriptive statistics using the FREQ procedure of SAS. Most animals (47.7%, min. 0, max. 63.9%) had imperfect locomotion and 7.6% (min. 0, max. 20%) presented the most severe degree. Some of them (6.1%, min. 0, max. 30%) had overgrown claws, and hock lesions were observed in 41.7% (min. 15%, max. 65.4%) of the cows; 7.2% (min. 0, max. 34.8%) of the animals had severely swollen hocks. Regarding the hygiene score, 10.7% (min. 0, max. 52.9%) had excessively dirty sides (scores 3 and 4), 40.9% (min. 0, max. 81%) had excessively dirty hind limbs and 19.3% (min. 0, max. 50%) of the cows showed excessively dirty udders. The welfare indicators recognized internationally can also be used in Brazilian intensive dairy farms. The animals studied face important animal welfare issues, and preventive measures should be taken to avoid them. Further studies are needed investigating the causes of the specified problems to improve animal welfare assessment.

**Key Words:** cows, lameness, incidence

**M12 Correlations between production traits and dairy cattle welfare indicators in 19 farms in southern Brazil.** G. B. Bond\*<sup>1</sup>, A. Ostrensky<sup>2</sup>, R. Almeida<sup>1</sup>, and C. F. M. Molento<sup>1</sup>, <sup>1</sup>Universidade Federal do Paraná, Curitiba, PR, Brazil, <sup>2</sup>Pontifícia Universidade Católica do Paraná, Curitiba, PR, Brazil.

The objective of this study was to analyze the correlation between animal welfare and production indicators for lactating cows in 19 dairy farms in southern Brazil, during the winter of 2009. The studied farms used confined or semi-confined systems, and had a median of 211 (max. 480, min. 80) lactating Holstein cows with a mean daily production of  $33.6 \pm 10.4$  kg/cow. The visits occurred during the morning or afternoon milking. A sample of 50 lactating cows per herd was selected, according to their position in the milking parlor, for locomotion scoring (0-good, 1-imperfect, 2-impaired, 3-severely impaired). After milking, another sample of 50 lactating cows was selected at the free stall. The animals were then scored for claw overgrowth (0-normal, 1-mildly overgrown, 2-severely overgrown), hock lesions (0-healthy, 1-hair loss, 2-abrasion), hock swelling (0-healthy, 1-mildly swollen, 2-severely swollen) and hygiene score (1-clean, 2-slight manure splashes, 3-demarcated plaques of manure, 4-confluent plaques of manure). The correlations were analyzed through Kendall Tau-b correlations in SAS (the CORR procedure). The correlations show that low BCS was associated to overgrown claws and to higher milk yield ( $-0.153$ ,  $P < 0.01$  and  $-0.186$ ,  $P < 0.01$ ). Also, later lactation was associated to higher BCS ( $0.184$ ,  $P < 0.01$ ). Severe hock lesions were associated to swollen hocks ( $0.402$ ,  $P < 0.01$ ). The cow hygiene indicators for 3 separate body parts are highly correlated. The correlations between cow dirtiness (side, hind limb and udder) and milk production were positive ( $0.132$ ,  $0.164$  and  $0.136$ , respectively,  $P < 0.01$ ). Later lactation was associated to less milk yield ( $-0.308$ ,  $P < 0.01$ ) and to cleaner sides and hind limbs ( $-0.123$  with sides,  $-0.124$  with hind limbs,  $P < 0.01$ ). There was no clear association between lameness and milk production. Higher locomotion scores were associated to more lactations in lifetime ( $0.229$ ,  $P < 0.01$ ). The correlations between animal welfare indicators and productive traits were generally low, but many are statistically significant. Other studies are needed, correlating indicators such as lameness and cow hygiene.

**Key Words:** dairy cows, milk yield, lameness

**M13 Effect of food restriction on the behavior of penned goats kids.** D. Oliveira, I. A. M. A. Teixeira\*, S. F. Souza, M. J. R. Paranhos da Costa, K. T. Resende, A. G. Pascoa, O. Boaventura Neto, and T. F. V. Bompadre, Universidade Estadual Paulista/UNESP, Jaboticabal, SP 14884900, Brazil.

The aim of this study was to evaluate the behavior and welfare of pre-weaned goat kids submitted to feed restriction. To adjust the period of observation, a preliminary trial was carried out to evaluate the circadian rhythm of 3 male Saanen kids. Direct way (video cameras) observations were conducted to evaluate the frequency and length of the behaviors. Data were analyzed using Rayleigh's Test of Uniformity (Oriana software). Based on the analyses of the circadian rhythm trial, 6 h of observation were defined per day: 10 a.m., 11 a.m., 12 a.m., 1 p.m., 3 p.m., and 4 p.m. Once established the hours for behavioral evaluation, 27 35 d-old goat kids (males, females, castrates) were subjected to 3 nutritional levels: without restriction (*ad libitum*), intermediate restriction (25%) and severe restriction (50%). The individual feed intake was daily recorded and the behavior observations were determined considering 11 categories (feeder, water drinker and pen interaction; reaction to human; active and passive social interaction; standing; lying; movement; bipedal and self-grooming). The evaluations were based on the frequency and length of the behaviors, totalizing 702 h

of observation. Data were analyzed as a 3x3x3 factorial arrangement (period of observation x nutritional level x sex) using PROC MIXED. DMI was lower than what is commonly reported for kids at similar age (8 g/day of DM), and there were not significant differences between nutritional levels ( $P = 0.47$ ) and sex ( $P = 0.27$ ). Kids subjected to severe feed restriction were less reactive to human and showed less reaction to external stimuli, staying in standing position for longer periods ( $F = 3.71$ ;  $P = 0.04$ ). Kids in this treatment also showed apathy and depression, indicating impaired welfare. All animals presented stereotypes. However, females were more sensitive to restrictive conditions, biting pen bars more often and for longer periods than other animals. This study showed that feed restriction affected animal welfare, which calls attention to the consequences in adopting such technique.

**Key Words:** behavior stereotype, chronobiology, dairy goat

**M14 Effect of metabolizable energy levels on the feeding behavior of Santa Inês sheep.** R. M. Fontenele\*, E. S. Pereira, P. G. Pimentel, M. S. de Souza Carneiro, A. B. Selaive Villarroel, and J. G. L. R. Filho, *Federal University Ceará, Fortaleza, Ceará, Brazil.*

The objective of this study was to evaluate the feeding behavior of Santa Inês sheep fed different levels of energy (2.08, 2.28, 2.47 and 2.69 Mcal/kg DM) in diets. Twenty lambs, average weight of 13 kg  $\pm$  0.56 kg and age 50 d, confined in individual pens with concrete floor and provided with feeders and drinkers. The animals were weighed, identified and treated for ecto and endoparasites, then distributed in 4 experimental treatments with different levels of metabolizable energy (2.08, 2.28, 2.47 and 2.69 Mcal/kg DM) in a randomized block design with 5 replications. The roughage used was the Tifton 85 hay. Since the experimental variables were subjected to ANOVA and regression using the Statistical Analysis System and Genetic - SAEG. Feeding time, expressed in h/day, decreased linearly ( $P = 0.02$ ) with the increase in energy levels of experimental diets (5.83, 5.87, 4.85 and 4.77 min/day, levels 2.08, 2.28, 2.47 and 2.69 Mcal/kg DM, respectively). With regard to leisure time, there was a linear increase ( $P = 0.03$ ), recording the values of 5.10, 5.65, 6.14 and 6.50 min/day, to levels 2.08, 2.28, 2.47 and 2.69 Mcal/kg DM, respectively. However, rumination, feeding efficiency (g DM/h and g NDF/h), and rumination efficiency (g NDF/h), were not affected ( $P > 0.05$ ) by levels of energy in diets. However, the efficiency of rumination (g DM/h), decreased linearly ( $P = 0.007$ ) with increasing energy levels in diets, recording values of 5.10, 5.65, 6.14 and 6.50 h/day, for the levels of 2.08, 2.28, 2.47 and 2.69 Mcal/kg DM, respectively. It was observed that the total mastication time (min/day), too, was influenced ( $P = 0.02$ ) the energy levels of the experimental diets, with linear effect, with values of 15.56, 14.63, 13, 78 and 13.08 min/day, for the levels 2.08, 2.28, 2.47 and 2.69 Mcal/kg DM, respectively. As for variables such as frequency of regurgitation, frequency of mastication, frequency of mastication and regurgitation of mastication time per regurgitation were not affected ( $P > 0.05$ ) by levels of energy in the diets.

**Key Words:** lamb, roughage:concentrate ratio, ruminants

**M15 Evaluation of feed behavior traits in beef heifers using a GrowSafe intake measurement system.** E. Mendes\*, G. Cartens, and L. Tedeschi, *Texas A&M University, College Station.*

The objective of this study was to evaluate the use of an electronic feed intake system to quantify feeding behavior traits in beef heifers. Feed intake and feeding behavior data were recorded in 32 heifers (initial BW = 285 kg) fed a high grain diet (3.1 Mcal ME/kg DM) for 81 d while confined to a pen equipped with 4 GrowSafe 4000E feedbunks (2-s read rate). Time-lapse video was used to record observations of individual

bunk visits for 10 heifers over 3 consecutive d. Bunk visit frequency (BVF) and duration (BVD) were computed using software (DAQ4000E ver. 9.22) at parameter settings (PS) of 30, 60, 100, 150 and 300 s, which defines maximum duration between transponder hits for a new event (default = 300 s). Meal frequency (MF) and duration (MD) were computed from BV data using a meal criteria as 5 min. Daily BVF and BVD data were split into 4 6-h periods for statistical comparison with observed video data using  $r^2$ , mean square error of prediction (MSEP), mean bias (MB), accuracy (Cb), and corrected Akaike's Information Criterion (AIC). Observed BVF and BVD (mean  $\pm$  SD) were 12.8  $\pm$  9.1 events and 18.0  $\pm$  12.1 min/6-h period. As PS increased from 30 to 300 s, BVF decreased (16.6, 12.7, 11.9, 11.6 and 11.4 events/6-h, respectively) and BVD increased (13.4, 16.0, 17.0, 17.7 and 18.3 min, respectively). Statistical analyses revealed that PS of 60 and 100 s generated predicted BVF data most similar to observed data (0.91 and 0.88, 0.1 and 0.2, 0.01 and 0.13, 1.0 and 0.9, and -218 and -192 for  $r^2$ , MSEP, MB, Cb, and AIC, respectively), while PS of 100 and 150 s generated predicted BVD data that were most similar to observed data (0.91 and 0.91, 0.2 and 0.2, 0.13 and 0.01, 1.0 and 1.0, and -203 and -201 for  $r^2$ , MSEP, MB, Cb, and AIC, respectively). Meal frequency and duration computed from BV data was minimally affected by PS. These results suggest that BVF and BVD computed with a PS of 100 s most accurately predicted observed feeding behavior traits, which were on average 94 and 95% of observed BVF and BVD, respectively.

**Key Words:** feeding behavior, intake

**M16 Feeding behavior and ruminal acidosis in beef cattle offered a total mixed ration or dietary components separately.** D. Moya<sup>1</sup>, A. Mazzenga<sup>2</sup>, L. Holtshausen<sup>3</sup>, G. Cozzi<sup>2</sup>, L. González<sup>4</sup>, S. Calsamiglia<sup>1</sup>, D. Gibb<sup>3</sup>, T. McAllister<sup>3</sup>, K. Beauchemin<sup>3</sup>, and K. Schwartzkopf-Genswein<sup>3</sup>, <sup>1</sup>UAB, Barcelona, Spain, <sup>2</sup>UP, Padova, Italy, <sup>3</sup>Agriculture Canada, Lethbridge, Canada, <sup>4</sup>U of Manitoba, Winnipeg, Canada.

Eighty continental crossbred beef heifers (414.9  $\pm$  37.9 kg BW), including 16 ruminally cannulated, were used in a 52-d experiment conducted as a complete randomized block design, to assess if, when allowed to select their own diet, heifers would choose a proportion of ingredients that prevents drops in ruminal pH and improves the rumen environment. Treatments were: TMR (85% barley-grain, 10% corn silage); free-choice diet (FCD) (BGCS) of barley-grain (BG) and corn silage (CS); FCD (BGDG) of BG and wheat distillers grain (DG); and FCD (CSDG) of CS and DG. Animals were housed in groups of 10 in 8 pens equipped for automatic recording of feeding events 24 h/d, allowing for the calculation of individual feeding behavior. Cannulated heifers were fitted with an indwelling pH probe to record ruminal pH every 60s. Data were summarized as mean pH, and area under the curve (AUC) with pH lower than 5.8. Ruminal samples were taken from cannulated animals 2 h post-feeding on d 4 and 42, for determination of VFA. Data were analyzed with a mixed model which included treatment, time and their interactions as fixed effects and pen as a random factor. Heifers fed TMR had lower ( $P < 0.05$ ) meal length, time, and size than those fed FCD. Cattle fed BGCS and BGDG increased ( $P < 0.05$ ) the proportion of BG intake over the trial up to 80 and 70%, respectively, by increasing ( $P < 0.05$ ) eating rate and maintaining ( $P > 0.10$ ) feeding duration of BG, and increasing ( $P < 0.05$ ) eating rate but decreasing ( $P < 0.05$ ) feeding duration of either CS or DG. Even with these changes, ruminal pH and VFA profile was not different ( $P > 0.10$ ) over the trial or compared with TMR. Cattle fed CSDG ( $P > 0.10$ ) maintained DG intake at 60% over the trial, and had greater ( $P < 0.05$ ) mean ruminal pH, AUC, and acetate to propionate ratio than those fed other treatments. Finishing feedlot cattle fed FCD including BG as an option consume

similar ingredients and have intake and ruminal fermentation profiles similar to those fed TMR.

**Key Words:** beef cattle, acidosis, feeding behavior

**M17 Association between facial hair whorl and temperament in noncastrated male cattle *Bos taurus* and *Bos indicus*.** R. Rivas\*<sup>1,2</sup>, A. Schmedek<sup>2</sup>, E. N. Andrade<sup>3,2</sup>, F. D. Resende<sup>2</sup>, G. R. Siqueira<sup>2</sup>, M. H. Faria<sup>2</sup>, and R. O. Roça<sup>3</sup>, <sup>1</sup>Centro Universitário da Fundação Educacional de Barretos - UNIFEB, Barretos, SP, Brazil, <sup>2</sup>Agência Paulista de Tecnologia do Agronegócio - APTA, Colina, SP, Brazil, <sup>3</sup>Universidade Estadual Paulista Júlio de Mesquita Filho - UNESP, Botucatu, SP, Brazil.

Studies have associated cattle temperament with the presence and location of facial hair whorls in these animals. The objective of this work was to investigate the relationship between facial hair whorl and temperament during weighing crate. Seventy-three noncastrated males were used (*Bos taurus* and *Bos indicus* – Angus and Nelore), aged between 20 to 22 mo. The animals were classified into 4 categories according to the location and presence of hair whorl: above the eye, at eye level, below the eye or absent upon entry into a handling crush. All animals were submitted to the same type of housing and handling. The first weighing crate was done 21 d after at the beginning of feedlot. Later, they were done every 21 d, always after a 12 h fasting period. Temperament was evaluated during weighing crate, according to the tension shown in the first 5 s after closing the gates to the scale. The animals were classified as relaxed or tense, based on the speed of movements and muscle tone. Response variables of hair whorl and temperament were evaluated through Spearman correlation in SAS. There was no significant association between facial hair whorl and temperament ( $P \geq 0.05$ ). Most animals (90.4%) were classified as tense during evaluations. The absence of whorl was observed in 57.1% of relaxed animals and 43.9% of tense animals did not show hair whorls. Hair whorl at eye level was observed in 42.9% of relaxed animals and 31.8% of tense animals. There were no relaxed animals among those with hair whorls above and below the eye. The location of facial hair whorls did not prove to be an applicable tool in the identification of temperament in noncastrated male cattle (*Bos taurus* and *Bos indicus*).

**Key Words:** bovine, Nelore and Angus, temperament

**M18 Comparison of adrenal responsiveness to corticotropin-releasing hormone (CRH) in Angus and Brahman steers of divergent temperament.** K. O. Curley Jr.\*<sup>1,2</sup>, J. A. Carroll<sup>3</sup>, R. C. Vann<sup>4</sup>, R. D. Randel<sup>1</sup>, and T. H. Welsh Jr.<sup>1</sup>, <sup>1</sup>Texas AgriLife Research, College Station, <sup>2</sup>Texas AgriLife Research, Overton, <sup>3</sup>USDA ARS, Lubbock, TX, <sup>4</sup>MAFES, Raymond, MS.

The objective of this study was to compare adrenal activity after pituitary stimulation with exogenous CRH, in cattle of differing temperament and breedtype. Using a combination of exit velocity, the rate at which cattle exit a squeeze chute and traverse a fixed distance (1.83 m), and pen score, a subjective assessment of cattle's behavior toward a handler, we identified the 10 calmest (C) and 10 most temperamental (T) weaned calves from a Brahman (B) and an Angus (A) herd. Blood samples were collected via indwelling jugular cannula for a period of 6 h pre- and 6 h post- administration of CRH (0.1 µg/kg BW). Sampling intervals were 15 min throughout the 12 h except for the initial 30 min of the post-challenge period when the sampling intervals were 5 min. Serum cortisol concentrations were determined by RIA. MIXED model repeated measures ANOVA was conducted for a factorial analysis of

(1) time and breed, within temperament, or (2) time and temperament, within breed, effects on hormone concentrations throughout the duration of blood sampling. Additionally, the GLM was utilized for ANOVA of adrenal response parameters. During the initial 3 h of sampling an effect ( $P < 0.01$ ) of breed was present in only the calm animals, as the A steers maintained higher cortisol concentrations than the B steers. Baseline cortisol concentrations were affected ( $P < 0.01$ ) by both breed ( $A = 16.7 \pm 2.7$ ;  $B = 9.7 \pm 1.2$  ng/ml) and temperament ( $t = 18.2 \pm 2.5$ ;  $C = 8.7 \pm 1.3$  ng/ml); no breed by temperament interaction was present. During the post-challenge sampling period there was a time by temperament interaction ( $P < 0.005$ ) observed within each breed. Only a breed effect ( $P < 0.005$ ) on peak stimulated-cortisol concentrations ( $A = 35.1 \pm 1.7$ ;  $B = 28 \pm 1.3$  ng/ml) was observed. However, only temperament influenced ( $P < 0.01$ ) the amplitude of the cortisol response ( $C = 22.3 \pm 2.1$ ;  $t = 14.1 \pm 2.0$  ng/ml). Thus, cattle characterized as temperamental exhibit an endophenotype of a higher basal secretion of cortisol coupled with a blunted adrenal response to exogenous CRH. The genetic bases of variation in endophenotype and temperament warrant investigation in cattle.

**Key Words:** adrenal, cortisol, temperament

**M19 Evaluation of temperament on pregnancy rate in beef embryo recipient cows.** S. S. Jennings\*<sup>1</sup>, K. J. Stutts<sup>1</sup>, C. R. Looney<sup>2</sup>, and T. H. Welsh Jr.<sup>3</sup>, <sup>1</sup>Sam Houston State University, Huntsville, TX, <sup>2</sup>OvaGenix, Inc., Bryan, TX, <sup>3</sup>Texas AgriLife Research, College Station.

The objective of this study was to determine if temperament had an effect on pregnancy rate (PR) of recipient females to embryo transfer (ET). Multiparous cows ( $n = 57$ ) of various breed compositions were used as recipient females. Donor and recipient females were synchronized using a vaginal insert containing progesterone in combination with estradiol 17β and prostaglandin F<sub>2α</sub>. Embryos were non-surgically collected 7 d after insemination and transferred to recipients the same day as fresh embryos, or were frozen-thawed embryos preserved in ethylene glycol. At the time of ET, cows were assigned a temperament score of 1 to 5 (1 = docile and 5 = aggressive) based on the cow's behavior while being confined in the chute. Following transfer of the embryo, 10 mL of blood was collected via coccygeal venipuncture to determine serum cortisol concentration to assess each cow's stress response to handling at the time of ET. Serum concentration of cortisol was quantified by RIA. Pregnancy exams were conducted using transrectal ultrasonography at least 21 d post transfer to determine PR. Cortisol data were analyzed using one-way ANOVA and PR was analyzed by chi-squared analysis using the frequency procedure. Pearson correlation coefficients were used to determine the relationship between PR and cortisol concentration. There was no effect of temperament score ( $P = 0.36$ ) on PR to ET and no relationship between PR and serum cortisol concentration ( $r = 0.18$ ). Recipients that were assigned temperament scores of 4 or 5 had a higher mean serum cortisol concentration (31.1 ng/mL) than recipients assigned scores of 1 to 3 (22.9 ng/mL) but this difference was not significant. Results of this study indicate that temperament of recipient females does not have a significant effect on PR to ET nor is there a correlation between PR and stress response of the recipient at the time of ET as indicated by serum cortisol concentration immediately following ET.

**Key Words:** temperament, recipient females, embryo transfer

**M20 Ingestive behavior and physiological parameters of cross-breed heifers under different feeding schedules.** R. A. S. Pessoa\*<sup>1</sup>, F. M. Silva<sup>1</sup>, M. A. Ferreira<sup>1</sup>, M. Azevedo<sup>1</sup>, L. H. S. Gomes<sup>1</sup>, E. C. Silva<sup>1</sup>, J. G. R. Cunha<sup>1</sup>, A. S. S. Filho<sup>2</sup>, D. C. Santos<sup>2</sup>, and J. C. V. Oliveira<sup>2</sup>, <sup>1</sup>Universidade Federal de Pernambuco, Recife, Pernambuco, Brasil, <sup>2</sup>Instituto Agronômico de Pernambuco, Recife, Pernambuco, Brasil.

The objective was to evaluate the physiology variables and ingestive behavior in heifers under different feeding schedules. The maximal and minimal temperatures in the period ranged from 25.8 to 31.4°C and 21.3 to 23°C, respectively. Five crossbreed housed heifers were used, with average live weight of 250 kg and age of 24 mo, in a 5 × 5 Latin square design. Each experimental period lasted 15 d, 10 d being for the adaptation of the animals to the diet and 5 d for data collecting. The animals were fed a TMR twice daily, and the diet was composed of 70% forage (41% of cactus pear and 29% bermudagrass hay) and 30% concentrate (14% soybean meal, 13.5% of corn meal and 1.5% mineral mixture) twice a day. The first meal was provided at 7:00 for all animals. The treatments consisted by different feeding schedules of the second meal (12:00; 14:00; 16:00; 18:00 or 20:00 h). The physiology variables were record 2 h before and 2 h later of the second meal (treatment). The ingestive behavior was record in a period of 24 h, in intervals of 10 min. The data were submitted to ANOVA using the SAS. The different feeding schedules affect the respiratory frequency and the rectal temperature after the meal, which decreased with the hours (61.0 to 40.8 movements/minute and 39.0 to 38.5°C for respiratory frequency and rectal temperature, respectively). The ingestive behavior was not affected by the treatments, with average of 822, 396 and 222 min/day for total time resting, total time ruminating and total time feeding, respectively. Overall, different times of feeding changed respiratory frequency and rectal temperature, whereas it did not affect the ingestive behavior of the crossbreed heifers.

**Key Words:** heifers, meal, feed management

**M21 Influence of exercise on feedlot performance and carcass characteristics in steers.** B. J. Howell\*<sup>1</sup>, J. R. Brethour<sup>2</sup>, and T. Noffsinger<sup>3</sup>, <sup>1</sup>Fort Hays State University, Hays, KS, <sup>2</sup>Agricultural Research Center, Kansas State University, Hays, <sup>3</sup>Production Animal Consultants, Benkelman, NE.

Cattle in feed yards are not commonly exercised beyond the confines of their pen, with the exception of possibly one or 2 re-implant events. The objective of this experiment was to investigate the effect of regular exercise on animal performance and carcass characteristics. Angus crossbred steers (n = 189) were stratified by initial body weight and ultrasonically measured carcass characteristics, and assigned randomly to 2 treatment groups (control vs. exercise) with 3 replications per treatment (n = 31 hd/replication). The exercise treatment protocol consisted of daily exercise for 5 d upon arrival, followed by alternate day exercise for the next 10 d, and then exercise 2 times/week for the remainder of the feeding period. The total feeding period was 124 d for replication 1, and 166 d for replications 2 and 3. Cattle in exercise treatment pens were allowed to exit their pen into a feed alley of an area approximately 67 × 13 m for 15 min and were then returned to their pen. The control animals were not removed from their pens with the exception of ultrasonic measurement of longissimus muscle characteristics. No differences ( $P > 0.05$ ) were observed between treatments for average daily gain, dressing percentage, backfat, calculated yield grade, marbling, proportion grading Choice, or kidney, pelvic and heart fat. Under the conditions of our study, this exercise treatment strategy did not affect feedlot average daily gain or carcass characteristics.

**Key Words:** exercise, beef cattle, feedlot

**M22 Lack of magnetic orientation of beef cattle.** M. Erikson\*, E. Leduc, R. Prince, and G. Gallagher, *Berry College, Mount Berry, GA.*

Recently published research suggests cattle and deer orient themselves toward the magnetic poles when grazing or at rest. However, this study was based on evaluation of satellite images with stringent criterion for data inclusion. We hypothesize that if orientation of cattle was not random, it could be due to environmental influences. Therefore, the objective of this study was to determine if pastured cattle exhibited orientation preferences and if that orientation could be attributed to environmental factors. Photographs of beef cattle (n = 585) on the Berry College campus pastures, were taken twice per week from Jan 20, 2009 – Feb 21, 2009, during the day between 0700h – 1100h (n = 283) by digital camera and at night between 2000h – 2200h (n = 279) using a FLIR thermal camera. Compass readings were obtained for each photograph using visible landmarks as points of reference to verify orientation of each photograph. Temperature, wind speed, and humidity were also recorded for all photographic events. Cattle orientation was determined by placing a transparent 360° grid, divided into 8 sectors on each image. Each sector was comprised of a 45° region bisecting respective primary directions of N (Sector 1), E (Sector 3), S (Sector 5) and W (Sector 7). Remaining sectors represented NE (Sector 2), SE (Sector 4), SW (Sector 6) and NW (Sector 8). Orientation of each animal was assigned to a sector based on the direction of the head relative to the longitudinal direction of the body. Chi-squared analyses were conducted under the assumption that animal orientation within each sector would be similar (12.5%) among the 8 sectors. Results indicated a larger ( $P < 0.05$ ) than expected (21.0%) orientation in Sector 2 (NE) and less than expected (6.6%;  $P < 0.05$ ) in Sector 1 (N). No differences ( $P > 0.05$ ) were found in orientation among the other sectors. These results suggest little evidence to support the concept of North – South cattle orientation as a result of the earth magnetic field or local environmental conditions.

**Key Words:** magnetic poles, cattle orientation

**M23 Effect of cattle liner microclimate on core body temperature and shrink in market-weight heifers transported during summer months.** M. Bryan\*<sup>1,2</sup>, K. Schwartzkopf-Genswein<sup>1</sup>, T. Crowe<sup>2</sup>, L. González<sup>3</sup>, and J. Kastelic<sup>1</sup>, <sup>1</sup>Agriculture and Agri-Food Canada, Lethbridge, Alberta, Canada, <sup>2</sup>University of Saskatchewan, Saskatoon, Saskatchewan, Canada, <sup>3</sup>University of Manitoba, Winnipeg, Manitoba, Canada.

Market weight heifers (n = 452; BW 619 ± 22 kg) were transported in one of 5 compartments within a cattle liner on 10 journeys (940 km) during summer months to study the effect of trailer microclimate during transit (T) and stationary (S) periods on core body temperature (baseline–journey temperature; ΔCBT) and live weight loss (loading weight–unloading weight; LWL) in market weight heifers. Microclimate measurements included temperature (Temp; °C) and temperature humidity index (THI). The trailer ceiling (TC) of all 5 compartments was fitted with a total of 45 temperature/humidity data loggers. A single data logger was also placed intravaginally in a subset of 10 heifers/liner to obtain core body temperature 2 d before transport (baseline), as well as during the entire journey until the time of off-loading. The same heifers also had a data logger affixed to their ear tag (ET) to determine the temperature at animal level. Data was analyzed with a mixed model considering the fixed effects of cattle liner, compartment and day as repeated measure, as well as the random effect of compartment × day and all possible interactions. Temp was greater during S than T (23.35 and 20.32 ± 0.44;  $P < 0.0001$ ) and also greater for ET than TC (23.20 and 20.48 ± 0.43;  $P < 0.0001$ ). ΔCBT was greater during S than T ( $P < 0.0001$ ) with values of 0.36 and 0.19 ± 0.06°C, respectively. Trailer

THI did not have an impact on  $\Delta$ CBT ( $P > 0.10$ ). However, a significant positive relationship ( $P < 0.03$ ) was observed between THI and LWL. There were no differences ( $P > 0.02$ ) in LWL among compartments. Trailer microclimate is variable according to location (animal level vs ceiling) within a compartment and whether the truck is in transit or is

stationary and can negatively impact animals during summer transport. The impact may be more severe on journeys that have long stationary periods.

**Key Words:** cattle, transport, microclimate