

Animal Behavior and Well-Being II

W1 The relationship between equine temperament and behavior as affected over time by the skill level of the rider. Taylor Huffman and Katherine Koudele*, *Andrews University, Berrien Springs, MI.*

The goal of this study was to determine if there was a relationship between horse temperament and incidence of misbehavior due to the stress of being ridden by riders with a wide range of ability during the course of a camp season (9 weeks). It was hypothesized that horses with a social or aloof temperament would be able to adjust more easily while those with a fearful or challenging temperament would have higher incidence of misbehavior. At the beginning of the summer season at Timber Ridge Camp, Spencer, Indiana, the temperament of each horse ($n = 15$) was determined using on a rubric based on criteria developed by Barteau (2007). During the camp season, each rider was evaluated for riding skill level, and each incidence of equine misbehavior on trail rides was recorded as were the lengths of the trail rides. The scale for misbehavior was 0–4 with 0 = was not ridden, 1 = no incidents, 2 = annoyance (i.e., head tossing, ear-pinning, moving out of line), 3 = disruptive (i.e., balking, kicking, moderate shying), 4 = hazardous (i.e., bucking, bolting, rearing). The rider skill level was evaluated using a rubric based on Blokhuis et al. (2008) with a scale of 1–4, 1 = an advanced rider and 4 = total novice. The skill level of the rider was multiplied by the length of the rides in minutes to develop a stress index. One-way ANOVA showed a highly significant relationship ($P < 0.0001$) between the stress index and incidence of misbehavior. The behavior scale data for misbehaviors were combined due to lower frequency of severe misbehaviors 3–4. Horses with a challenging temperament exhibited significantly more misbehavior ($P = 0.007$) as did horses with a fearful temperament ($P < 0.0001$). Horses with social or aloof temperaments did not show any significant increase in misbehavior. The results support that in a summer camp horse program a positive relationship exists between stress and misbehavior of horses which varies with their temperament ($P = 0.02$). Horses with fearful or challenging temperaments appeared to be more stressed than horses with a social or aloof temperament based on their greater incidence of misbehavior. It is therefore recommended that horses be temperament tested before entering a summer camp program.

Key Words: horse temperament, rider skill level, misbehavior

W2 Better welfare outcomes in lambs subjected to gradual weaning when compared with abrupt weaning. Cristiane G. Titto*¹, Fábio L. Henrique¹, Evaldo A. L. Titto¹, Adroaldo J. Zanella², Henrique B. Hooper¹, Lina F. P. Rodriguez¹, Ana Luisa S. Longo¹, Thays M. C. Leme-dos Santos¹, Raquel F. Calviello¹, Jessica C. Veronezi¹, and Alfredo M. F. Pereira³, ¹*Faculdade de Zootecnia e Engenharia de Alimentos, Universidade de São Paulo, Pirassununga, São Paulo, Brazil*, ²*Faculdade de Medicina Veterinária e Zootecnia, Universidade de São Paulo, Pirassununga, São Paulo, Brazil*, ³*Instituto de Ciências Agrárias e Ambientais Mediterrânicas, Universidade de Évora, Évora, Alentejo, Portugal*.

Weaning is a stressful process during the early-life of lambs. The aim of this study was to compare 2 types of weaning on cortisol levels and rectal temperature of 47 crossbreed lambs. During gradual weaning (GW, $n = 12$ males, $n = 10$ females), for 6 d, from d 39 to 44, the mothers were removed from the paddock at 7:00AM, and the lambs were kept separated from them until 17:00h. During the GW the same animal groups were maintained and lambs had free access to clean and fresh

water, pasture and concentrate. On d 45, the lambs were placed in the feedlot and blood samples for cortisol levels evaluation were taken at 3 different moments: the first during the last contact with the mother (T1), the second 60 min after entering the feedlot (T2) and the third 180 min after entering the feedlot (T3). On d 46 and 47, the samples were taken once a day, 24 h and 48 h after the entry into the feedlot, respectively. The abrupt weaning (AW, $n = 9$ males, $n = 15$ females) began at d 45 of age, and the samples were collected in a similar way as reported for GW. Statistical analyses of variance were divided in 2 steps: the first at d 45 for both GW and AW, with fixed effects of sex, type of weaning and sample time and interactions; the second one analyzed the d 45, 46 and 47 and had fixed effects of sex, days of total separation of the mother and type of weaning as their interactions. Means were compared by F test and *t*-test (PDIFF). On d 45, AW lambs had higher cortisol levels ($1.74 \mu\text{g} \cdot \text{dL}^{-1}$) compared with GW lambs ($0.93 \mu\text{g} \cdot \text{dL}^{-1}$; $P < 0.05$), and time had no effect on type of weaning. However, the first sample, just after the separation, was 66.6% higher than the T2 and 76.2% higher than T3 ($P < 0.05$). GW lambs had lower cortisol levels ($1.38 \mu\text{g} \cdot \text{dL}^{-1}$) than AW lambs ($2.22 \mu\text{g} \cdot \text{dL}^{-1}$) on d 45, 46 and 47 ($P < 0.05$) when they were in the feedlot. Sex had no effect on cortisol levels ($P > 0.05$). When weaning is done early and lambs are allowed to have a period to adapt to solid feed and to the absence of their mother, there is less activation of the stress axis after total separation and on the beginning of the feedlot period.

Key Words: cortisol, sheep, stress

W3 Assessing cow-calf welfare. Gabrielle E. Simon*¹, Bruce R. Hoar², and Cassandra B. Tucker¹, ¹*University of California, Davis, Davis, CA*, ²*University of Wyoming, Laramie, WY*.

Certification programs are one way beef producers can assess and communicate information about animal welfare to the public. Programs have been created to monitor cattle all the way through production (e.g., Global Animal Partnership) or at individual stages (e.g., slaughter; American Meat Institute), but to date, there is no certification program addressing welfare specifically at the cow-calf level. The objectives of this study were to gather animal-based prevalence information, describe management practices and facility characteristics, and identify welfare risk factors on cow-calf operations. A welfare assessment was designed using features of similar programs in the beef and dairy industries and was applied to 25 California ranches that varied in herd size (mean \pm SD, range: 669 ± 751 , 28 – 2450 cows), specialization (i.e., commercial, purebred, grass-finished), and geographic location. Cow health and behavior and stockperson handling measures were collected during a chute-side procedure, management practices were evaluated through an interview-guided questionnaire, and facility characteristics were recorded at the chute and water access points. Cattle health problems were rare and only seen on specific ranches (e.g., prevalence of lame cattle: 1.5 ± 1.6 , 0 – 7.1%). Conversely, cattle behavior and stockperson handling varied between ranches (e.g., cattle balking prevalence: 16.5 ± 16.2 , 1.6 – 71.4%, electric prod use: 21.5 ± 21.1 , 0 – 73.0%). Although some management characteristics were shared by all (e.g., all producers reported having a veterinary/client/patient relationship), a variety of practices were reported (e.g., weaning age: 8.1 ± 1.5 , 6 - 11 mo). Likewise, some facility features were common (e.g., 20 curved head gate stanchions vs. 4 straight) and other aspects varied (e.g., 14 restraints without louvers vs. 10 with louvers). A risk factor evaluation

will identify which inputs (i.e., stockperson handling, management practices, facility design) influence welfare on cow-calf operations.

Key Words: welfare assessment, cow-calf, risk factor

W4 Identifying the principal problems of animal welfare on intensive dairy farms in the central zone of Chile. Maria Sol Morales*, Lorena Carmona, Tamara Tadich, and Carlos Alvear, *Facultad de Ciencias Veterinarias y Pecuarias, Universidad de Chile, Santiago, RM, Chile.*

Animal welfare (AW) on 19 intensive dairy farms (DF) from the central zone of Chile was studied using Welfare Quality protocol (WQP); 18 were qualified between acceptable and enhanced, one as non-classified, and none as excellent. The objective of the present study was identify the specific problems of AW on these DF using the data on which the evaluations were made. WQP assesses AW on animal-based observations (cow or herd level) and on indirect information from farm records. For each observation or record, an average value/DF was obtained and compared with the alarm value (AV) for each indicator; AV is considered as the minimum value acceptable. For some indicators, AV was provided by WQP, otherwise this was calculated as 25% of the distance between maximum and minimum value found on the evaluation. Then the percentages of DF that exceeded the AV for each indicator were obtained and ranked to identify the principal problems. Problems were related to animal health, where 78.9, 52.6, 53, 40 and 40% of DF exceeded the AV on: % cows with areas of hairless patch, Total % of lame cows, % of cows with dystocia, mortality and downer cows, respectively; although some sanitary indicators as: % of cows with oral, nasal or vulvar secretions, as well % of cows with diarrhea did not show problems at all. Housing problems are mainly related to dirtiness (68.5, 57.9, 52.6% of DF had problems on: % of cows with udder dirty, % of cows with flank/upper leg dirty and % of cows with dirty lower legs, respectively). With regard to animal behavior, social interaction among cows did not seem to be a major problem; however, at human-cow interaction there is poor AW: 64.7 and 58.8% of DF showed problems with flight zone and % of cows that can be touched, respectively. Good feeding aspects did not appear as a major AW problem. The results show diverse aspects of management and housing, which affect the AW of dairy cows. This study has identified those problems that deserve greater attention in training of farm workers. Funded by project No. FOOD-CT-2004-506508 and CONICYT.

Key Words: animal welfare, dairy cow

W5 Identifying farm-level factors affecting milking attendance and productivity in automated milking systems. Meagan T. M. King*¹, Ed A. Pajor², Stephen J. Leblanc³, and Trevor J. DeVries¹, ¹*Department of Animal and Poultry Science, University of Guelph, Guelph, ON, Canada,* ²*Faculty of Veterinary Medicine, University of Calgary, Calgary, AB, Canada,* ³*Department of Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, ON, Canada.*

The objective of this study was to determine how barn design, herd management, and lameness prevalence relate to automated milking system (AMS) attendance and productivity. Data were collected from 26 AMS farms in Eastern Ontario, Canada. Farms averaged 108 ± 13 (mean \pm SE) lactating cows and 2.3 ± 0.3 AMS units. The majority of farms used free-flow cow traffic ($n = 24$), while 2 farms employed a mixture of free-flow and milk-first traffic for different groups. Physical barn characteristics and stocking densities were recorded, and comple-

mented by a questionnaire regarding feeding and bedding management. At each farm, 40 cows were gait scored (or 30% for herds > 130 cows) using a 5-point numerical rating system (1 = sound to 5 = lame). Cows were defined as lame with gait scores ≥ 3 ($28.4 \pm 2.8\%$) and severely lame as ≥ 4 ($2.9 \pm 0.7\%$). For a 6-d period, milking activity and production parameters for all cows at each farm were extracted from the respective AMS computers. Data were summarized across all cows and the 6-d observation period for each farm and analyzed in multivariable mixed-effect regression models. Milking frequency (2.9 ± 0.1 milkings/cow/d) increased with herds of greater average parity ($P = 0.04$; mean = 2.2 ± 0.4 lactations), greater frequency of feed push up/d ($P = 0.04$; mean = 9 ± 1.2 /d), and when stalls were raked ≥ 3 /d vs. 2 /d ($P = 0.01$), while it decreased with a greater prevalence of severe lameness ($P = 0.008$). Milk yield (32.6 ± 0.5 kg/d) increased with herd size ($P = 0.01$) and feed space/cow ($P < 0.001$; mean = 70.4 ± 2.6 cm/cow). Lying time (706 ± 11.8 min/d) was greater with concrete flooring ($P = 0.045$) as opposed to rubber flooring, and tended to decrease with lying stall neck rails placed further from the back curb ($P = 0.07$; mean = 172.0 ± 1.6 cm). Lying bouts (8.9 ± 0.3 no./d) were less frequent with a greater prevalence of lameness ($P = 0.01$), and tended to be less frequent with longer stall lengths ($P = 0.07$; mean = 248.9 ± 3.4 cm). These results demonstrate that behavior and productivity in AMS herds may be positively affected by modifiable housing and management practices and are negatively affected by a higher prevalence of lameness.

Key Words: automatic milking, dairy cow, behavior

W6 Differences in cow comfort between traditional bedded pack and compost bedded pack for dairy housing systems. Anna Fernández, Eva Mainau, Xavier Manteca, Cinta Sol*, and Lorena Castillejos, *Animal Nutrition and Welfare Service, Animal and Food Science Department, Universitat Autònoma de Barcelona, Bellaterra, Spain.*

The objective of this research was to compare cow welfare between 2 different types of dairy cattle housing systems, compost bedded pack (CB) and traditional bedded pack (TB), using the Welfare Quality protocol. Both behavior indicators (time needed to lie down) and health indicators (dirtiness of the cows, body condition, hairless patches, lesions and swellings, lameness, nasal and ocular discharge, hampered respiration, diarrhea, and vulvar discharge) were evaluated as indicators of cow welfare. The study was conducted on 2 commercial dairy farms (816 and 394 lactating cows) between the spring 2013 and the summer 2014. Data from behavior and health indicators were collected from 451 lactating cows (11.28 ± 0.29 cows for each farm, season and treatment) and 1222 lactating cows (30.5 ± 0.6 for each farm, season and treatment) respectively. Statistical analyses were carried out with the SAS 9.2 software applying a MIXED procedure for behavior and GLIMMIX procedure for health data. Regarding behavior, cows took a similar amount of time to lie down in CB and TB (4.8 ± 0.08 and 4.7 ± 0.07 s; $P > 0.05$). For health indicators, the percentage of cows with dirtiness on the udder was higher ($P < 0.05$) in CB (50.7 ± 2.61) than TB (44.0 ± 3.33) in summer and spring. Conversely, in winter, the percentage of cows with dirtiness on the hindquarters was higher ($P < 0.05$) in TB (61.7 ± 2.93) than CB (50.3 ± 2.99). Cows allocated in TB showed higher prevalence of hairless patches on the flank, side and udder than in CB (10.8 ± 1.57 and 9.6 ± 1.55 ; $P < 0.05$) in summer. There were no other differences in health measures between cows housed in CB and TB throughout the year. Most of the welfare parameters evaluated did not differ between the 2 loose housing systems, with the exception of dirtiness and hairless patches.

Key Words: compost bedded pack, cow comfort, lactating cow

W7 Behaviors of Holstein heifers associated with large follicles during the estrous cycle. Cassandra S. Skenandore* and Felipe C. Cardoso, *University of Illinois, Urbana, IL.*

Estrus detection in heifers is pivotal for reproductive success. The objective of this study was to identify behaviors associated with 2 different periods of the estrous cycle of Holstein heifers. Eighteen heifers at breeding age were selected, balanced by age, BW, and BCS (average 13.7 ± 1 mo, 394 ± 32 kg, and 3.43 ± 0.1 respectively), and observed for 6 wk. The experimental period was divided into 3 periods of 14 d each. All heifers received the same basal diet to meet requirements (NRC 2001), fed once daily. Visual observations were performed in 30 min segments every 2 h from 6AM to 6PM. Video recordings were used to confirm observations. Twelve behaviors were recorded (Social Lick, Rump Lick, Tail Paint Lick, Body Butt, Head Butt, Push, Chin Rest, Anogenital Sniff, Play Rub, Winner, Mount, and Attempt Mount). A synchronization protocol starting on d 1 of each period (Ovsynch: 100mg GnRH at d 1, 25mg PGF $_{2\alpha}$ at d 7, and 48 h later an application of 100mg of GnRH) was used to stimulate periods of high and low interactions. Observations were summarized to daily counts of interactions for each behavior. Ovaries were examined via ultrasound imaging on d 1, 8, and 10 of each period. The presence of follicles or a corpus luteum (CL) was recorded with their respective sizes. Lying time, standing time, and bouts /d were recorded using accelerometers (Onset HOBO Pendant G) at 1 min intervals for 14 d. Statistical analyses were performed using the GLIMMIX procedure of SAS (v9.3). During periods of low activity per the synchronization protocol, social ($P < 0.01$) and paint ($P < 0.05$) licking were more likely to be expressed than estrus-related behaviors such as rump licking ($P < 0.05$), chin resting ($P < 0.002$), and mounting ($P < 0.003$). The aforementioned estrus related behaviors were also performed in more frequency than other behaviors when a large follicle is present ($P < 0.03$). Heifers spent more time standing and less time lying per day when they had a large follicle ($P < 0.006$) compared with a small follicle. In conclusion, increased activity and specific behaviors may be used in the future to facilitate estrus detection in heifers.

Key Words: heifer, behavior, heat detection

W8 Behavioral responses of periparturient Jersey cows treated with recombinant bovine somatotropin during the periparturient period. Henrique F. Soares¹, Daniela N. Liboreiro*¹, Gabriel D. Bombardelli¹, Paula R. B. Silva¹, and Ricardo C. Chebel^{1,2}, ¹University of Minnesota, St Paul, MN, ²University of Florida, Gainesville, FL.

Objectives were to determine the effects of recombinant bovine somatotropin (rbST) treatment of Jersey cows from -21 to 21 d relative to calving on rumination, activity, and lying behavior. Cows were assigned randomly to control and rbST (125 mg of rbST every 7 d from -21 to 21 d relative to calving) treatments. Cows (n = 50) were fitted with rumination/activity collars (SCR) and lying behavior loggers (HOBO) from -21 to 21 d relative to calving. Rumination and activity were recorded every 2 h and lying behavior was recorded every 1 min. Data were analyzed in 24 h intervals. Continuous data were analyzed by ANOVA using the PROC MIXED procedure for repeated measures with cows as the experimental unit. The model included treatment (control vs rbST), time (days relative to calving), and the interaction between treatment and time. Daily rumination time was not ($P = 0.74$) different between treatments in the prepartum, but rbST cows had reduced daily rumination time in the postpartum (rbST $_{125} = 428.5 \pm 17.0$, control = 484.3 ± 16.7 min/d, $P = 0.03$). The interaction between treatment and time affected ($P < 0.01$) daily rumination time because from 0 to 7 d postpartum treatments did not differ, but in most days from 8 to 21 d

postpartum control cows had greater daily rumination time. Treatment did not affect activity during the prepartum ($P = 0.97$), but control cows tended to have greater activity during the postpartum (540.3 ± 33.7 vs 499.1 ± 36.1 arbitrary units; $P = 0.12$). Lying time was not affected by treatment (prepartum- $P = 0.34$, postpartum- $P = 0.72$). Treatment by time interaction affected number of lying bouts in the prepartum ($P < 0.01$) and rbST cows tended to have greater number of lying bouts in the postpartum (rbST = 7.2 ± 1.1 , control = 6.5 ± 1.6 bouts/day). Lying bout duration was not different in the prepartum ($P = 0.86$), but rbST cows tended to have shorter lying bout duration in the postpartum (rbST = 83.9 ± 3.8 , control = 93.5 ± 3.7 min/bout; $P = 0.08$). Reduced rumination and increased lying bouts during the postpartum period among rbST treated cows may be associated with changes in metabolic and health status resulting from rbST treatment.

Key Words: Jersey cow, behavior, recombinant bovine somatotropin

W9 Preference of flavored concentrate premixes by dairy cows. Michael T. Harper*¹, Joonpyo Oh¹, Fabio Giallongo¹, Juliana C. Lopes¹, Alexander N. Hristov¹, and Joelle Faugeron², ¹The Pennsylvania State University, University Park, PA, ²Pancosma, Geneva, Switzerland.

Flavor preferences may stimulate feed intake in dairy cows, which may improve energy balance in early lactation and lead to increased milk production. A cafeteria experiment was designed to determine if dairy cows have flavor preferences. Sixteen lactating Holstein cows averaging 197 ± 32 DIM, 1.9 ± 0.8 lactations, 27.8 ± 4.2 kg/d DMI, and 41.5 ± 7.4 kg/d milk yield were involved in the experiment. Cows were offered 7 flavored and a control concentrate premixes (FCP). The FCP flavors were: anise, fenugreek, honey, orange, thyme, molasses, vanilla, and the absence of flavor acted as a control. The inclusion rate of the flavors in FCP was 250 to 300 g/t, as-is basis. Cows were not adapted to the flavors before the experiment. Cows were housed in a tie-stall barn and were offered each d 4 different FCP of 1 kg each in plastic bins placed in front of each cow. The duration of the experiment was 6 consecutive days. Each FCP was presented to each cow once every 2 d, 2 h after the morning feeding. Thus, each flavor was presented to each cow 3 times during the experiment. Flavors and position of the bins in front of the cows were randomized. Each cow had access to the FCP for 5 min from the time they started eating. Eating times were recorded. Amount consumed and rate of FCP consumption were analyzed using the MIXED procedure of SAS with cow as random effect. The vanilla and fenugreek FCP were consumed the most ($P = 0.03$) at 408 and 371 g per 5 min offering, respectively, while the orange and anise FCP were consumed the least at 264 and 239 g, respectively. Similarly, cows spent the most ($P = 0.002$) time eating the vanilla and fenugreek FCP at 99 and 75 s, respectively, and the least amount of time eating the orange and anise FCP at 49 and 50 s, respectively. There was an effect of bin position with the 2 center FCP being consumed more ($P < 0.001$) than the outer 2 FCP. There was a trend for flavor by bin position interaction ($P = 0.07$) for the amount consumed, but not ($P = 0.11$) for the time spent eating. Flavor had no effect on consumption rate. In conclusion, dairy cows may prefer vanilla or fenugreek flavors, when offered a novel choice.

Key Words: feed intake, flavor preference, dairy cow

W10 Sorting of TMR by dairy calves is affected by availability of an alternative source of grain. Joao H. C. Costa*, Nicola A. Adderley, Daniel M. Weary, and Marina A. G. von Keyserlingk, *Animal Welfare Program, University of British Columbia, Vancouver, BC, Canada.*

We performed 2 trials on sorting behavior in individually raised dairy calves ($n = 18$). For both, calves were provided free access to TMR [$49.1 \pm 1.5\%$ DM (Mean \pm SD); chemical composition shown as % of DM, CP $16.9 \pm 0.95\%$, NDF $31.8 \pm 2.68\%$, ADF 20.4 ± 1.77] and calf starter [with an overall DM of 89.5% ; chemical composition shown as % of DM, CP $20.6 \pm 1.13\%$, NDF $16.5 \pm 0.39\%$, ADF $7.84 \pm 0.45\%$] for the first 2 mo of life. Sorting was assessed at 65 d, when calves still had access to calf starter, and again at d70 when starter was no longer available. On each day, sorting was measured by comparing diets before feeding with orts after 24 h of feed access. Particle sizes were measured using the Penn State Particle Separator with 3 screens (19, 8, and 1.18 mm) and a bottom pan to separate the TMR into long, medium, short, and fine fractions respectively. The predicted intake of each particle size fraction in the orts was tested between treatment for a difference from 100 using *t*-tests. When able to access the calf starter, calves sorted the TMR selecting for long particles ($133 \pm 9\%$; $P = 0.0038$) and against small particles ($92 \pm 3\%$; $P = 0.0240$), with no differences for the remaining particle fractions ($99 \pm 5\%$ [$P = 0.90$] for medium; $107 \pm 5\%$ [$P = 0.14$] for fine). When calves no longer had access to the starter these preferences reversed; calves preferentially selected the fine particles ($113 \pm 4\%$; $P = 0.01$), with no selection for the other fractions ($101 \pm 11\%$ [$P = 0.94$] for long; $99 \pm 6\%$ [$P = 0.80$] for medium; $97 \pm 4\%$ [$P = 0.51$] for short). These results indicate that young dairy calves are capable of sorting TMR and adjust their sorting behavior in response to changes in feed offered.

Key Words: feeding behavior, sorting behavior, motivation

W11 Predicting filching: A logistical approach. Kristina A. Weld*, Louis E. Armentano, and Amy L. Stanton, *University of Wisconsin, Madison, WI*.

Understanding the feeding behavior of dairy cattle in greater detail can lead us to broader conclusions about animal welfare. One feeding behavior of interest is filching, in which cows steal feed from an automatic gate which they do not have access to, rather than taking the easier route and eating out of a gate that they have access to. The objective of this study was to determine factors that predict filching behavior. Sixty-three cows (28 primiparous, 35 multiparous, average 76 DIM) were assigned to 4 mixed parity groups. All cows were in the same physical pen containing 32 Insentec Roughage Intake Control feed gates (Insentec BV, Marknesse, the Netherlands), but each group had access to a different set of 8 randomly assigned gates. For the first 6 weeks, cows were fed a common diet, followed by a second 3 week period in which cows were fed 1 of 2 diets that differed only in the variety of soybean that they contained. Data were analyzed with logistic regression (Proc Glimmix) in SAS 9.4. For the first 6 weeks, filching at or above 0.5% of diet was positively associated with hip height ($P = 0.01$). Cows that filched above 1% in the second period consumed 92% (Confidence Interval 89–95%) of their filched feed from their unassigned diet which is significantly above the amount that would be predicted if they filched randomly from unassigned gates (67%). Hip height was positively associated with filching and meal length was shorter for cows that filched in the second period ($P < 0.05$). Filching in period 1 was not predictive of filching during period 2. Filching was not associated with the number of bunk displacements. These models indicate that height is a requirement for filching in this gate arrangement. However, competition does not necessarily drive filching indicating that filching may not be driven by necessity. Because cattle are willing to work for a novel feed, regardless of competition, this may indicate that cattle are willing to work to experience novelty. This might indicate that provision

of novelty, in the form of alternative feeds, plays a larger role in cattle welfare than previously thought.

Key Words: filching, welfare, novel feed

W12 Validation of methodology for assessing heat abatement strategies in dry-lot cattle. Grazyne Tresoldi*, Karin Schütz², and Cassandra Tucker¹, ¹Center for Animal Welfare, Department of Animal Science, University of California, Davis, Davis, CA, ²Farm Systems North, AgResearch Ltd., Ruakura Research Centre, Hamilton, New Zealand.

Identifying dairy cattle experiencing heat stress can improve welfare and profitability. However, it is unclear how often we need to observe the animals for this purpose, nor the relevance of specific aspects of the heat stress response, particularly in terms of panting (e.g., closed vs. open mouth panting). Our objectives were to refine and validate methodology used to assess heat load in dairies by (1) determining sampling intervals to measure usage of heat abatement resources (HAR; sprayed water or shade); and (2) evaluating the relationship between respiration rates (RR) and panting characteristics (PC; drooling, open mouth, and tongue outside the mouth). High-producing lactating cows (>40 kg milk/d) were chosen from 4 California dry-lot dairies (8 cows/dairy, $n = 32$) and observed for at least 6 h (1000 to 1800 h, excluding milking) when air temperature, humidity and the combined index averaged 33°C , 30% and 79, respectively. Use of HAR by individual cows was recorded continuously. Every 5 min, RR and presence/absence of PC (observed for 10 s at a time) were recorded. For use of HAR, estimates from different sampling intervals (1, 5, 10, 15, 20, 30, 60, 90 and 120 min) were derived from continuous data. Linear regression was used to compare these estimates against the continuous measurements. Sampling intervals were considered accurate if they met 3 criteria: $R^2 \geq 0.9$, intercept = 0 and slope = 1. The relationship between RR and each PC was analyzed using mixed models with random effects for cow and cow \times PC, to generate appropriate error degrees of freedom. When the sampling interval for HAR was ≤ 60 min, R^2 values were ≥ 0.9 and both the intercept and slope did not differ from 0 and 1, respectively ($P > 0.05$). RR was higher when PC were present (least squares means \pm standard error, breaths/min: with vs. without drool present, 97 ± 3 vs. 74 ± 3 ; open vs. closed mouth, 100 ± 4 vs. 80 ± 3 ; tongue outside vs. inside the mouth, 96 ± 4 vs. 81 ± 3 ; $P < 0.001$). In summary, use of HAR is best measured when using sampling interval ≤ 60 min. Panting was accompanied by higher RR, and further analysis is planned to determine appropriate sampling intervals for these measures.

Key Words: well-being, behavior, cooling

W13 Infrared thermography as a tool to diagnose foot rot and digital dermatitis in feedlot cattle. Sonia Marti¹, Randy E. Wilde¹, Diego Moya*^{1,2}, Eugene D. Janzen², Michael J. Jelinski³, Craig L. Dorin³, Karin Orsel², Ed Pajor², Jan Shearer⁴, Suzanne T. Millman⁴, Johann F. Coetzee⁴, Dan Thomson⁵, and Karen S. Schwartzkopf-Genswein¹, ¹Agriculture and Agri-Food Canada, Lethbridge, AB, Canada, ²University of Calgary, Faculty of Veterinary Medicine, Calgary, AB, Canada, ³Veterinary Agri-Health Services Ltd., Airdrie, AB, Canada, ⁴Iowa State University, College of Veterinary Medicine, Ames, IA, ⁵Kansas State University, College of Veterinary Medicine, Manhattan, KS.

Diagnosis of lameness due to infectious claw lesions in beef cattle can be extremely challenging under commercial feedlot conditions resulting in inappropriate medical treatment and unnecessary drug and labor costs.

The objective of this study was to determine if infrared thermography could be used to make a differential diagnosis between foot rot (FR) and digital dermatitis (DD) based on claw area temperatures. Over a 16-mo period, 470 lame cattle from the same commercial feedlot in Southern Alberta were examined while restrained in a squeeze chute. Thermographic images were taken using a Flir i40 infrared camera, and processed with ThermCam QuickView 1.3 (Flir Systems Inc., Burlington, ON, Canada) from the anterior and posterior views of each affected hoof, and the laterally adjacent unaffected hoof within the same animal, to obtain temperature differentials. Limb position (fore or hind) of the imaged hoof was also recorded. Temperatures from the underside view of the affected limb were also measured. Ambient temperature and relative humidity within the examination barn were recorded using a Hobo U23 Pro v2 logger (Onset Computer Corporation, Bourne, MA). After images were obtained, the affected hoof and lesion were cleaned with a brush and a physical exam was conducted to determine the actual cause of lameness. Data were analyzed using a mixed effect model with diagnosis, affected limb and their interaction as a main effects, and ambient temperature and relative humidity as covariates. No differences were observed in temperatures of unaffected and affected hooves for either FR or DD cases ($-1.3 \pm 0.22^\circ\text{C}$ and $-0.7 \pm 0.37^\circ\text{C}$, respectively ($P = 0.15$) for the anterior view, and $-0.9 \pm 0.16^\circ\text{C}$ and $-1.2 \pm 0.24^\circ\text{C}$, respectively ($P = 0.41$) for the posterior view). In addition, temperatures from the underside view were not different ($P = 0.67$) between FR ($35.9 \pm 0.12^\circ\text{C}$) and DD ($35.8 \pm 0.18^\circ\text{C}$). Under the conditions of this study, infrared thermography was not a useful tool for differentiating between beef feedlot cattle diagnosed with foot rot and digital dermatitis.

Key Words: lameness, feedlot, cattle

W14 Continuous recording versus scan-sampling in behavioral studies with growing heifers fed high-concentrate diets.

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Continuous observation is an accurate method for behavioral measurements in ruminants but is very time-consuming. An alternative is scan-sampling (SC), in which behavior is recorded at regular intervals. The aim of this study was to compare the loss of information when different SC intervals were chosen to record heifer behavior. Behavior of 8 growing heifers fed a high-concentrate diet was recorded on 6 non-consecutive days. Continuous sampling (CS) was considered the control treatment and was used to evaluate scan-sampling intervals of 2, (SC2), 5 (SC5), 10 (SC10), 15 (SC15), 20 (SC20) and 30 (SC30) min. Two additional sampling techniques were considered: a time sampling of the first 10 min of every hour (TS), and the continuous observations during 4 h post-feeding (4PF). Behaviors were expressed as a percentage of the total daily activity. A square root-arcsine transformation was applied to achieve normal distribution. Differences were analyzed by using the GLIMMIX procedure of SAS. The model contained the fixed effect of treatment, and the random effects of heifer and day. Pearson correlations were used to compare CS with SC treatments. Daily time in each behavioral activity using the SC and TS treatment did not differ from CS ($P > 0.10$). In contrast, 4PF affected behavioral measurements. Time spent ruminating, social behavior and self-grooming were 50, 41 and 38% lower ($P < 0.001$), while eating and resting times were 28 and 17% higher ($P < 0.001$) in 4PF than CS. For all behaviors, high correlations were observed between CS and SC2 ($r > 0.93$; $P < 0.001$) and between CS and SC5 ($r > 0.75$; $P < 0.001$). For eating, drinking,

social, self-grooming, tongue-rolling, licking and biting fixtures, and rummaging in wood shavings, the longer the scan interval, the lower was the correlation. For ruminating and resting, correlations between CS and SC30 were greater than 0.90 ($P < 0.001$). In conclusion, the use of SC or the TS treatment did not result in any loss of information. However, 4PF is not an accurate technique for measuring behavioral activities in ruminants.

Key Words: beef cattle, behavior, scan-sampling method

W15 Evaluation of technologies to predict the onset of calving in Holstein dairy cows. Véronique Ouellet*¹, Elsa Vasseur², Wolfgang Heuwieser³, Onno Burfeind³, Xavier Maldague⁴, and Édith Charbonneau¹, ¹*Département des Sciences Animales, Université Laval, Québec, QC, Canada*, ²*Organic Dairy Research Center, University of Guelph, Alfred, ON, Canada*, ³*Clinic for Animal Reproduction, Faculty of Veterinary Medicine, Freie Universität Berlin, Berlin, Germany*, ⁴*Département de Génie électrique et de Génie Informatique, Université Laval, Québec, QC, Canada*.

Dystocias are common in dairy cows and are known to have labor, production, reproduction, welfare and economic implications. A technology that would accurately predict the onset of calving would help minimize the effects of dystocia by allowing producer intervention in a timely matter. The aim of this study was to assess the performances to predict calving using a decrease in vaginal temperature, rumination time, and lying time or an increase in number of lying bouts measured by 3 technologies. The combination of technologies allowing simultaneous measure of the variables was also tested. Forty 2 multiparous Holstein cows housed in tie-stall were fitted with a temperature logger, a rumination sensor and an accelerometer 7 \pm 2 d before their expected calving date. Data collected during the last 120 h before calving were summarized per day and in 6 h periods. Differences between days and between periods were analyzed using proc GLIMMIX of SAS. Test performances (sensitivity, specificity, predictive values) were conducted to predict calving within the next 24, 12 or 6 h. Vaginal temperature were 0.3°C lower ($P < 0.05$) whereas rumination and lying time were respectively 41 and 52 min lower ($P < 0.05$) on calving day compared with the 4 d precalving. Cows had 2 more lying bouts on calving day ($P < 0.05$). While comparing tested variables, a decrease of vaginal temperature achieved the best performance to predict calving within the next 24, 12, and 6 h. Between those periods, the best performance was achieved for a prediction within the next 24 h with a sensitivity, specificity, positive and negative predictive values respectively of 74, 74, 51, and 89%. Combining the technologies enhanced the performance to predict calving with best results obtained by the combination of the 3 technologies for a prediction within the next 24 h (sensitivity: 77%, specificity: 77%, positive and negative predictive values: 56 and 90%). These results suggest that technologies are better at identifying events during which the cow did not calve than calving events. Therefore, a device that would be able to measure the 4 variables may not be able to accurately predict calving time but would provide insightful information for calving monitoring.

Key Words: technologies, calving, dystocia

W16 Barrow behavioral reactivity to a human or novel object when fed low versus high fiber diets. Jessica D. Colpoys*¹, Nicholas K. Gabler¹, Caitlyn E. Abell², Aileen F. Keating¹, Suzanne T. Millman¹, Janice M. Siegford³, and Anna K. Johnson¹, ¹*Iowa State University, Ames, IA*, ²*DNA Genetics, Columbus, NE*, ³*Michigan State University, East Lansing, MI*.

Low energy, higher fiber diets (HFD) are becoming more prevalent in the US swine industry due to fluctuating corn-soy diet prices. In sows, HFD are reported to increase satiety and reduce stereotypic behavior, aggression, and activity. However, little is known about how fiber content in diets contributes to behavioral reactivity in grow-finish pigs. Therefore, the objective of this study was to determine if diet influences behavioral reactivity using a human approach test (HAT) and novel object test (NOT). We hypothesized that pigs reared on HFD would be less reactive to HAT and NOT compared with pigs reared on high energy, low fiber corn-soy diets (CD). Forty Yorkshire barrows (48 ± 8 kg BW) were randomly allocated to 2 treatments: HFD ($n = 20$) and CD ($n = 20$). The barrows were evaluated once using HAT and once using NOT utilizing a crossover experimental design. Each pig was individually tested within a 4.9×2.4 m test arena for 10 min between 1300 and 1900 h. Behavior was evaluated using live and video observations. The video was watched continuously by one trained observer for latency, frequency, and duration of human and novel object (orange traffic cone) touches, frequency of escape attempts, frequency of freezing postures, activity (number of arena line crossings), urination, and defecation. Data were analyzed using the Glimmix procedure of SAS with fixed effects of diet and test week, covariate of body weight, and random effect of pen. Diet did not alter latency to first touch, touch frequency, or duration of touches with the human or novel object ($P > 0.10$). Similarly, frequency of escape attempts, freezing, activity, and urination did not differ between diets during HAT or NOT ($P > 0.10$). Barrows fed HFD defecated more during NOT ($P = 0.01$), and tended to defecate more during HAT compared with CD barrows ($P = 0.06$). Differences in defecations are likely due to high fiber content of HFD resulting in more waste excretion. These results suggest that feeding high fiber diets did not alter grow-finisher barrow behavioral reactivity.

Key Words: approach, fear, high fiber diet

W17 A novel objective chute score interacts with monensin to affect growth of receiving cattle. Kelsey A. Bruno*, Eric S. Vanzant, Alex W. Altman, Monoj Kudupojje, and Kyle R. McLeod, *University of Kentucky, Lexington, KY.*

Temperamental animals often have lower gains associated with reduced intake and/or efficiency. Temperament is ill defined. Thus, different temperament measures may relate differently to production traits. Also, hepatic oxidation theory (HOT) suggests that propionate can exacerbate intake depression in stressed cattle. To examine relationships between diet, temperament, growth, and health, 160 crossbred steers were used in a 56-d RCBD experiment with a $2 \times 2 \times 2$ factorial treatment structure. The experimental unit was pen (5 pens/treatment). Steers were pen fed a corn silage-based diet with or without monensin, ad lib. Temperament treatments (assigned on d -7) were exit velocity (EV; slow vs. fast) and objective chute score (OCS; low vs. high), a novel temperament measure, the CV of weights collected at 5 Hz for 10 s while an animal's head was restrained in a chute. Both were measured on d -7, 1, 14, 28, 55, and 56. Subjective chute scores (SCS) were measured on d -7 and d 56 by 4-5 observers. Jugular blood samples were analyzed for antibody response to leptospirosis vaccine. There was a positive correlation between SCS and OCS ($P < 0.01$; $R^2 = 0.38$) and SCS was moderately repeatable among observers (Krippendorff's $\alpha = 0.58$ to 0.67). Treatment x day

effects ($P < 0.10$) for EV and OCS indicated that initial measures may be better proxies of growth than average measures. There were no interactions between EV and OCS ($P \geq 0.24$) and no interactions between treatments ($P \geq 0.12$) on intake (%BW). Monensin decreased intake ($P < 0.01$) without effect of temperament. Thus, our hypothesis regarding HOT was not supported. Gains, antibody titer, and gain:feed responses to monensin depended on OCS ($P < 0.10$) but not ($P \geq 0.34$) EV. Gain was reduced ($P < 0.10$) by monensin with low, but not high OCS and gain:feed was increased ($P < 0.10$) and titer response decreased ($P < 0.10$) by monensin on high, but not low OCS. Gain and intake tended ($P \leq 0.15$) to be reduced in fast, compared with slow EV steers. Results provide novel indications that certain temperament measures can interact with dietary manipulation to influence animal performance.

Key Words: temperament, growth, monensin

W18 Could forming uniform body weight groups at entrance result in improved performance, behavior, health and carcass in fattening Holstein bulls? Marçal Verdú*¹, Alex Bach^{2,1}, Armando Pérez³, and Maria Devant¹, ¹*IRTA-Ruminant Production, Animal Nutrition, Management, and Welfare Research Group, Caldes Montbui, Spain*, ²*ICREA, Barcelona, Spain*, ³*Grup Alimentari Guissona, Guissona, Spain.*

The purpose of the present study is related to the criterion that should be followed to form animal groups according to BW, and to evaluate the effect of this practice on productive, behavior, or health outcomes when animals are mixed at the onset of fattening. A total of 160 Holstein bulls (162 ± 0.3 kg BW and 124 ± 1.1 d age) were allocated in 8 pens with similar mean BW, and were randomly assigned to 1 of 2 treatments: homogeneity of initial BW that corresponded to a CV of BW within a pen of 7% (HO), and heterogeneity with a CV of BW within a pen of 21% (HE). Concentrate intake and health incidences were recorded daily, straw consumption weekly, and BW every 14 d. Animal behavior was registered on d 0, 1, 3, 5, 8, 14, 28 and every 28 d by scan sampling. Animals were slaughtered after 206 d, and HCW and carcass quality were recorded. Data were analyzed using a mixed-effects model with repeated measures. Performance and carcass data were not affected by the BW uniformity of the groups at the onset. However, while the CV of BW within HO was maintained ($P > 0.10$) throughout the study ($6.1 \pm 0.73\%$), the CV of BW within HE was reduced ($P < 0.01$) from 21.5 to $10.7 \pm 0.86\%$ at the beginning and at the end, respectively. During the 1st month HO exhibited ($P < 0.05$) lesser completed mounts than HE (0.5 and 1.0 ± 0.09 times/15 min). Throughout the study HO tended ($P = 0.10$) to perform more self-grooming compared with HE (13.6 and 11.6 ± 0.13 times/15 min). Whereas 80% of veterinary therapies applied in HE were chronic (≥ 3 consecutive treatments in the same animal), 90% of therapies in HO were acute (≤ 2 consecutive treatments in the same animal, $P < 0.05$). Moreover, 6 HE bulls were removed from the study for health reasons. In conclusion, even if bulls from pens with a non-uniform BW at the onset had greater frequency in completed mounts and worse health status than bulls from pens with uniform BW at the onset, animal growth and carcass was not impaired.

Key Words: bull, BW uniformity, performance