

Animal Behavior and Well-Being II

TH159 Group size of veal calves does not affect production, physiological, or hematological indicators of welfare and has transient effects on health. E. M. Abdelfattah², M. M. Schutz³, D. C. Lay Jr.¹, J. N. Marchant-Forde¹, and S. D. Eicher*¹, ¹USDA-ARS, W. Lafayette, IN, ²Banah University, Moshtohor, Qalyubia, Egypt, ³Purdue University, W. Lafayette, IN.

Holstein-Friesian bull calves (n = 168; 44 ± 3 d of age), were used to investigate the effect of group size on performance, health, hematology, and welfare of veal calves. Groups of calves were assigned to 1 of 3 group housing treatments with 2, 4, or 8 calves per pen (initial BW 65.3 ± 3.7, 66.5 ± 3.7, and 67.6 ± 3.7 kg, respectively). The pens within 2 barns were 3 × 1.20 m (2 calves/pen), 3 × 2.40 m (4 calves/pen), and 3 × 4.80 m (8 calves/pen), and provided the same space (1.8 m² per calf) during the 5-mo finishing period. All calves were fed milk replacer and solid feed twice daily at 12 h intervals. Body weights were measured at the beginning (Initial BW) and at the end of the experiment (Final BW). Hip height and heart girth were recorded monthly for 5 mo. Health was evaluated monthly using the University of Wisconsin calf health scoring chart. Data were analyzed as a RCB with repeated measures using PROC MIXED (SAS). No differences ($P \geq 0.5$) among treatments were found regarding BW or ADG for the entire 5-mo period. Group size resulted in similar hip height change ($P = 0.41$) and heart girth change ($P = 0.18$) over 5 mo. The incidence of diarrhea was similar among treatments ($P \geq 0.15$). An interaction of treatment and month was detected for both cough ($P = 0.03$) and nasal discharge ($P = 0.02$) scores. During mo 1, calves in groups of 8 or 4 coughed more compared with calves in groups of 2, whereas, in mo 2, calves in groups of 8 coughed more than calves in groups of 4 or 2. In mo 4, calves in groups of 8 had less nasal discharge than calves in groups of 2 or 4. Plasma cortisol ($P = 0.37$) and blood hemoglobin ($P \geq 0.13$) concentration were not affected by group size. In conclusion, the number of veal calves in a group, given the same space, has no detrimental effect on performance, and has transient effects on health of veal calves. Housing veal calves in group size of 2, 4, or 8 can be equally effective in terms of production and has no clear negative effect on welfare.

Key Words: group size, production, veal calf

TH160 Effect of meloxicam on gain and behavior of calves castrated by banding preweaning. J. A. Daniel*¹, P. D. Krawczel², and B. K. Whitlock³, ¹Department of Animal Science, Berry College, Mt. Berry, GA, ²Department of Animal Science, The University of Tennessee, Knoxville, ³Department of Large Animal Clinical Sciences, College of Veterinary Medicine, The University of Tennessee, Knoxville.

The objective was to determine if oral meloxicam (M; a non-steroid anti-inflammatory) administered at castration of pre-weaning calves affected ADG or behavior. Prior to castration (14 d), Angus bulls were assigned to bull (BULL; n = 7; age 106 ± 6 d; BW = 174.2 ± 7.7 kg; scrotal circumference 17.7 ± 0.4 cm), castrated (BAN; n = 12; age = 105 ± 5 d; BW = 144.5 ± 7.6 kg; scrotal circumference = 16 ± 0.4 cm) or castrated with meloxicam (BAN+M; n = 13; age = 121 ± 6 d; BW = 145.8 ± 6 kg; scrotal circumference = 16.1 ± 0.3 cm) treatments with consideration of potential as a herd sire. On d 0, BAN and BAN+M had a rubber band applied tightly around the scrotum, and BAN+M also received oral M (2 mg per kg BW). On d 0, 14 and 28, animals were weighed and a 10-mL blood sample was collected via the tail vein for plasma concentrations of haptoglobin and fibrinogen. Dataloggers were

affixed to the left rear leg to record behaviors [mean lying time (h/d), mean lying bouts (n/d), and steps (n/d)] at 1-min intervals, moved to the right rear leg on d 14 and removed on d 28. Behavior data were tested for effect of treatment, day, and treatment by day interaction and ADG data were tested for effect of treatment, period (pre, d 0–14, and d 14–28) and treatment by period interaction using JMP procedures for repeated measures. Day 0–14 ADG was greater for BULL than BAN or BAN+M ($P < 0.05$), but no other time periods or groups differed. Plasma concentrations of fibrinogen were greater for BULL than BAN or BAN+M on d 28 and BULL, BAN and BAN+M on d 0 ($P < 0.05$). Plasma concentrations of fibrinogen on d 14 for BAN+M were greater than BAN and BAN+M on d 28 ($P < 0.05$). In the first 14 d period, BULL spent more time lying on d 2, 3 and 13 and less on d 8 and 11, took more steps on d 7, 8, 10, 11, and 12, had more lying bouts on d 4 and 13 than BAN and BAN+M ($P < 0.05$). BULL had more lying bouts than BAN on d 3 and 14 and more than BAN+M on d 5, 6 and 12 ($P < 0.05$). BAN took more steps on d 8, and had fewer lying bouts on d 3 than BAN+M ($P < 0.05$). Castration of pre-weaned calves decreased ADG and altered behavior. Fewer steps and more lying bouts for BAN+M suggest pain abatement.

Key Words: calf, castration, behavior

TH162 Panting score and respiratory rate in *Bos indicus* growing heifers. A. Camacho*¹, B. J. Cervantes², and R. Barajas¹, ¹Facultad de Medicina Veterinaria y Zootecnia, Universidad Autonoma de Sinaloa, Culiacan, Sinaloa, Mexico, ²Ganadera Los Migueles, S.A. de C.V., Culiacan, Sinaloa, Mexico.

Panting score (PS) has been proposed as a practical method of estimate the thermal status of cattle exposed to high environmental heat loads. PS was developed using *Bos taurus* cattle, differences in heat tolerance and greater use of *Bos indicus* cattle in hotter areas of the world, generating interest in validating the use of PS in these kind of cattle. In this study, 50 *Bos indicus* heifers (195.8 ± 0.38 kg) were utilized to evaluate the relationship between panting score and respiratory rate in *Bos indicus* growing heifers. Heifer were weighed individually and randomly assigned to 1 of 2 types of allotment: (1) dirt-floor pens (6 × 12 m) without shade (No Shade); and (2) Pen as described plus shade (Shade). Shade was provided with ceiling of 6 × 4 m of metal sheeting positioned 3.7 m over soil level. During 30 d of experiment, each 2 d air temperature (t °C) and relative humidity (RH, %) were recorded at 1400 h inside of shaded and no shaded pens. panting score and respiratory rate (RR) were recorded at 1400 h in one heifer from each pen. PS was recorded using a 7-point score (0, 1, 2, 2.5, 3, 3.5, and 4), where PS = 0 indicates no elevation in RR (no thermal stress), and PS = 4 indicates severe thermal stress (open mouth, tongue fully extended, head dropped, rapid labored breathing). RR was visually determined (±5 min). Each heifer-day was considered as experimental unit. Results were analyzed using linear regression procedures. Mean, maximum and minimum temperatures were 36.8, 44.2 and 25.4°C, respectively. Mean, maximum and minimum HR were 49.9, 89.4 and 33.2%, respectively. Significant relationships ($P < 0.00001$) were found between RR and PS in all cases. The equation obtained from heifers in Shade allotment was: RR (breaths/min) = 37.69 + 30.7957PS ($R^2 = 0.90$; n = 75). The equation from No Shade data was: RR (breaths/min) = 32.3416 + 35.6930PS ($R^2 = 0.84$; n = 75). And General relationship (polled Shade and No Shade data) was: RR (breaths/min) = 36.169 + 33.5561PS ($R^2 = 0.91$; n = 150). Results

suggest that panting score is a practical tool to assess the thermal status in *Bos indicus* cattle exposed to high temperatures.

Key Words: *Bos indicus*, hot weather, panting score

TH163 Effects of misting systems on physiological responses of dairy heifers in freestalls. G. A. Silva¹, S. V. Matarazzo^{*2,1}, I. Arcaro Junior¹, L. M. Toledo¹, and J. B. Demski¹, ¹Instituto de Zootecnia, Nova Odessa, SP, Brazil, ²Universidade Estadual de Santa Cruz, Ilheus, BA, Brazil.

The thermal environment is a major factor that can negatively affect dairy. Cooling methods should be used to increase the cows' ability to lose heat and alleviated these adverse factors. To improve the thermal environment the objectives of this trial was to evaluate the influence of evaporative cooling on physiological responses of dairy heifers in freestall. Twelve heifers were allocated in 3 treatments (4 heifers/treatment) in a Latin rectangle design (Blouin et al., 2009). Treatments were applied from January to May, 2012. The trial was divided into 6 periods of 13 d (6-d for adaptation and 5-d for data collection). The treatments assigned were: Control (not cooled), Fan and misting on at any relative humidity (FM), Fan and misting on when the relative humidity \leq to 70% (70% FM). The freestall was equipped with misting (36L/h) and fans (2.5 m/s) installed about 2.5 m above the feeding area. Air temperature and relative humidity inside and outside the facility were measured every 15 min over a period of 24 h using a data logger. Respiratory frequency (flank movement), rectal temperature (clinic thermometer) and rump surface temperature (infrared thermography) were taken each 3-h from 0800 to 1600 on all 30 d of data collection. The air temperature was decreased ($P < 0.05$) at 1600 and 1900 in FM (27.3°C) and 70% FM (27.5°C) treatment in relation to control (28.0°C). The relative humidity was higher than 70% at 0700 and 1900 in FM (96.5 and 81.1%) and 70% FM (87.5 and 75.2%) treatments. The temperature and humidity index (THI = 67) was in thermoneutral zone in all treatments. The respiratory rate showed positive results ($P < 0.05$) with lower values for treatments provided with fan and misting (49 vs. 55 movement/minute) when compared with control. Also, the rump surface temperature were lower ($P < 0.05$) in fan and misting treatments (34.1 vs. 35.0°C). Heifers showed similar ($P > 0.05$) rectal temperature (38.9°C). We conclude that treatments with misting systems were able to recover a thermal environment for the animals and it was reflected in physiological responses.

Key Words: misting, heifer

TH164 Estrus behavior in young Holstein heifers. B. F. Silper^{*1}, M. M. Reis¹, A. M. L. Madureira¹, T. A. Burnett¹, A. M. de Passillé², J. Rushen², and R. L. A. Cerri¹, ¹University of British Columbia, Vancouver, BC, Canada, ²Agriculture and Agri-Food Canada, Agassiz, BC, Canada.

Estrus behavior of young Holstein heifers was described to improve knowledge of estrus detection. Behavior was evaluated for one estrus episode from each of 10 heifers (mean \pm SD; 10.1 \pm 0.5 mo old, 331.3 \pm 33.7 kg of BW and 125.7 \pm 4.1 cm in the withers) housed in a free stall barn in 2 groups of 11 and 12 heifers. Estrus behavior was recorded by video, activity monitored by data loggers attached to a rear leg, and behavioral changes were validated by comparison with ovarian ultrasonography. Thirty-one behaviors were evaluated during 15 h before and 15 h after the activity peak. Baseline behavior was monitored in a corresponding 30 h period one wk before estrus. Number of steps (NSTEP) and percentage of lying and standing times were obtained from the data

loggers. Continuous data was analyzed by ANOVA using the proc GLM of SAS. NSTEP (mean \pm SE) during estrus was 3 times higher than on baseline day (205.6 \pm 12.8 and 77.8 \pm 15.7 steps/h, respectively; $P < 0.0001$). The increase in NSTEP ranged from 130% to 523% among heifers. Percent time standing increased from 44 \pm 4% to 64 \pm 3% during estrus ($P < 0.01$). There was an increase in the occurrence of chin rest, acceptance of chin rest, attempt to mount, acceptance of mount, licking, being pushed and head butting ($P < 0.05$). Previously undescribed behaviors, such as following other heifers and crossing between front and back of the pen also increased (25-fold and 4-fold, respectively; $P < 0.01$). NSTEP was positively correlated with acceptance of chin rest ($R^2 = 0.80$), attempt to mount ($R^2 = 0.68$), and crossing ($R^2 = 0.62$). There was more than one heifer in estrus at the same time for 6 of the analyzed episodes. Chin rest, acceptance of chin rest, and front attempt to mount were reduced when more than one heifer was in estrus at the same time ($P < 0.05$), suggesting certain behaviors of estrus may be more difficult to detect when animals are synchronized. Estrus was apparent in behavioral changes but the difference between heifers in the degree of estrus expression was large. The increase in expression of many behaviors and the strong correlation with NSTEP reveals potential for improvement of on-farm estrus detection and heat detection based reproductive programs.

Key Words: estrus behavior, heat, mount

TH165 Effect of calving management on calf vitality, blood gas, behavior, and intake for 24 hours after birth. P. Ji¹, H. M. Gauthier^{*1}, S. Y. Morrison¹, S. E. Williams¹, K. M. Morrill², D. M. Haines³, and H. M. Dann¹, ¹William H. Miner Agricultural Research Institute, Chazy, NY, ²Cornell Cooperative Extension, Canton, NY, ³The University of Saskatchewan and The Saskatoon Colostrum Co. Ltd., Saskatoon, SK, Canada.

Management of cows during calving may affect the well-being of the calf. Holstein heifers were housed in a bedded pack (21 \pm 1 d) with a 4.6 \times 4.0 m blinded area and were moved when calving was imminent to either an individual pen (IND; n = 24) or left in the pack (GRP; n = 23). Calves (n = 47) were evaluated. Labor duration and calving difficulty were recorded. Calf vitality was assessed and samples of caudal auricular arterial blood and jugular venous blood were collected at 0, 12, and 24 h. Behavior was monitored using visual observations, video review, and data loggers for 24 h. Calves were fed 675 g of colostrum replacer (184 g IgG; The Saskatoon Colostrum Co. Ltd.) at 1.5 h and were offered 1.89 L of milk replacer (MR) at 12 h. Data were analyzed as a completely randomized design using the MIXED procedure of SAS with repeated measures as appropriate. IND heifers were moved at 89 \pm 11 min before calving. Mean birth weight was 37.9 \pm 1.1 kg and 38.2 \pm 0.8 kg for IND and GRP, respectively. Labor tended to be longer for IND than GRP (116 and 91, SE = 10 min, $P = 0.10$). There was no treatment effect ($P > 0.10$) for calving difficulty score (1.6 \pm 0.1), or calf measures of temperature (39.0 \pm 0.1°C), pulse (136 \pm 3 bpm), or respiration (56 \pm 2 bpm). Arterial blood showed increased acidosis at 0 h for IND over GRP based on differences ($P < 0.05$) in pH (7.18 and 7.29; SE = 0.01), HCO₃⁻ (21.7 and 27.2; SE = 0.9 mEq/L), anion gap (18.6 and 13.9; SE = 0.7 mmol/L), and base excess (-7.2 and -1.4; SE = 0.7 mmol/L). Feeding behavior at 0 or 12 h did not differ ($P > 0.10$), but IND consumed 0.32 L less MR than GRP ($P = 0.08$). At 24 h, no differences were found in serum total protein (5.5 \pm 0.1 g/dL), IgG (19.2 \pm 0.7 g/L), or apparent efficiency of absorption (34.4 \pm 1.2%). From 1.5 to 24 h, standing (154 \pm 13 min; 26 \pm 2 bouts) did not differ ($P > 0.10$) between IND and GRP. Measures of calf vitality and behavior showed no effect of treatment. The stress of moving and isolation of

primigravid heifers in labor tended to increase labor duration with calves experiencing possibly more hypoxia and metabolic acidosis at 0 h and a decreased appetite at 12 h, regardless of eutocia.

Key Words: calving, acidosis, IgG

TH166 Herd-level reproductive performance and its relationship with lameness and leg injuries on freestall dairy farms. N. Chapinal^{*1}, M. A. G. von Keyserlingk¹, R. L. A. Cerri², K. Ito³, S. J. LeBlanc⁴, and D. M. Weary¹, ¹*Animal Welfare Program, University of British Columbia, Vancouver, BC, Canada*, ²*Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC, Canada*, ³*Novus International Inc., St. Charles, MO*, ⁴*Population Medicine, University of Guelph, Guelph, ON, Canada*.

Individual cows experiencing lameness are thought to have poorer reproductive performance. The objectives were to describe the variation in herd-level reproductive outcomes and to investigate the associations between these outcomes and the prevalence of lameness, hock injuries and knee injuries on 53 freestall dairy herds from the Northeastern US. Five reproductive outcomes were measured for a 12-month period for all multiparous cows in the herd using records from Dairy Comp 305: calving to conception interval (CCI), calving interval (CI), conception rate at the first insemination (CR1), pregnancy rate (PR), and insemination risk (IR). The prevalence of lameness (score ≥ 3 in a 5-point scale), hock injuries (score ≥ 2 in a 3-point scale) and knee injuries (scored as presence or absence) was assessed in one high producing pen. The mean \pm SD for the 5 reproduction outcomes were: CCI = 127 ± 10 d, CI = 404 ± 10 d, CR1 = $37 \pm 5\%$, IR = $60 \pm 7\%$, PR = $20 \pm 3\%$. The average prevalence of clinical lameness, hock injuries and knee injuries were 45 ± 19 , 58 ± 31 , and $31 \pm 22\%$, respectively. Univariable associations between the reproductive outcomes and the predictors (prevalence of lameness and leg injuries) were tested and significant predictors were submitted to a model that included herd size as a covariate. Farms with higher prevalence of lameness had longer average CCI (estimate = 0.16 ± 0.07 ; $R^2 = 0.09$) and CI (estimate = 0.14 ± 0.07 ; $R^2 = 0.07$), and farms with higher prevalence of knee lesions had lower CR1 (estimate = -0.08 ± 0.03 ; $R^2 = 0.13$) and PR (estimate = -0.05 ± 0.02 ; $R^2 = 0.11$). These results suggest that management to reduce rates of lameness and injuries may improve reproductive performance at the herd level. Further research is needed to investigate other factors that may contribute to or confound this relationship.

Key Words: conception rate, knee injury, pregnancy rate

TH167 Associations between herd-level factors and lying behavior of freestall-housed dairy cows. K. Ito^{*1,2}, N. Chapinal¹, D. M. Weary¹, and M. A. G. von Keyserlingk¹, ¹*Animal Welfare Program, University of British Columbia, Vancouver, BC, Canada*, ²*Novus International Inc., St. Charles, MO*.

The objective of the current study was to investigate the associations between herd-level factors and lying behavior of high-producing dairy cows housed in freestall barns. Lying behavior of approximately 40 cows (38 ± 2) was monitored on each of 40 farms in the Northeastern United States (NE) and 39 farms in California (CA). All cows in the pen were gait scored using a 1-to-5 scale to calculate the prevalence of overall clinical lameness (score ≥ 3) and severe lameness (score ≥ 4). Facility and management measures such as stall design, bedding quality and flooring surface were collected. Herd-level factors associated with daily lying time, standard deviation (SD) of daily lying time, frequency of lying bouts, and lying bout duration at the univariate level were submitted to

multivariable general linear models. In NE, daily lying time increased with the use of deep bedding (estimate = 0.80 ± 0.31 h/d) and as average DIM of the focal cows increased (estimate = 0.08 ± 0.04 h/d for a 10-d increase). The SD of daily lying time decreased as stall stocking density increased (estimate = -0.08 ± 0.03 h/d for a 10% increase), and increased with the presence of rubber flooring in the pen (estimate = 0.16 ± 0.08 h/d) and percentage of stalls with fecal contamination (estimate = 0.04 ± 0.01 h/d for a 10% increase). Frequency of lying bouts decreased (estimate = -1.90 ± 0.63 bouts/d) and average bout duration (estimate = 15.44 ± 3.02 min) increased with the use of deep bedding. In CA, daily lying time decreased as average DIM of the focal cows increased (estimate = 0.08 ± 0.03 h/d for a 10-d increase). The SD of daily lying time decreased when feed was delivered more than once per day (estimate = -0.24 ± 0.08 h/d). The percentage of lame cows was correlated with the percentage of stalls with fecal contamination ($r = 0.45$), which in turn was associated with fewer (estimate = -0.25 ± 0.06 bouts/d) and longer (estimate = 1.85 ± 0.39 min) lying bouts. These results suggest that lying behavior at the herd level but should be interpreted in context with lameness prevalence, production parameters, and facility management.

Key Words: deep bedding, lameness, management

TH168 Prevalence of knee and hock injuries and their association with stall base, bedding depth and bedding type on Canadian tie-stall dairy farms. C. Nash^{*1}, J. Zaffino¹, D. Kelton¹, D. Pellerin², T. DeVries³, AM de Passillé⁴, J. Rushen⁴, E. Vasseur⁵, and D. Haley¹, ¹*University of Guelph, Guelph, ON, Canada*, ²*Université Laval, Québec, QC, Canada*, ³*University of Guelph – Kemptville Campus, Kemptville, ON, Canada*, ⁴*Agriculture and Agri-Food Canada, Agassiz, BC, Canada*, ⁵*University of Guelph – Alfred Campus, Alfred, ON, Canada*.

Injuries to the knees and hocks of dairy cows are a common problem and are useful animal-based indicators of inadequate cow welfare, management, and housing design. The objective of this study was to examine the relationships between knee and hock injuries and stall base, bedding type, and bedding depth on 100 Canadian tie-stall dairy farms in Ontario ($n = 40$) and Quebec ($n = 60$). Forty Holstein cows per herd were assessed for knee and hock injuries on a 4-point scale (0 being no damage to 3 being severely swollen) by 13 trained observers and were considered injured if a score of 2 (lesions) or 3 (swelling greater than 2.5 cm) was given on one or more limbs. Inter- and intra-observer agreement for injury scoring met or exceeded a minimum Kw of 0.6. Stall base type and bedding type were recorded on each farm. Bedding depth was measured on a representative sample of 4 to 8 stalls for each of the 100 farms visited. Bedding depth was classified as deep (2 cm or greater) or little (under 2 cm). Pair-wise comparisons were made using a 2-sample *t*-test. The mean herd-level prevalence and range of knee injuries and hock injuries was 43% (0–89%) and 56% (6–94), respectively. Rubber mats (51% of herds) and mattresses (44% of herds) were the most common base type, while straw was the most common bedding type (85% of herds). Farms using other base types, such as cement, represented only 4% of our herds and so were excluded from further analysis. Farms using the combination of deep bedding on mattresses had 25% fewer knee injuries (30.88 ± 4.96 vs. $56.27 \pm 4.54\%$; mean \pm SE) and 24% fewer hock injuries (45.51 ± 4.62 vs. $69.42 \pm 2.59\%$) than farms using little or no bedding on rubber mats ($P = 0.002$). Although the high level of injuries on some farms is concerning, it is promising that other farms have few to no knee or hock injuries. There was an association between stall base and bedding, and the prevalence of hock and knee injuries on tie-stall dairy farms, indicating that the

right stall base and bedding combination may help minimize hock and knee injuries on dairy cows.

Key Words: cow comfort, injury, stall base and bedding

TH169 Effect of cow comfort on longevity on tie-stall farms in Eastern Canada. F. Bécotte*¹, E. Vasseur³, D. Lefebvre², A.-M. de Passillé⁴, J. Rushen⁴, D. B. Haley³, and D. Pellerin¹, ¹Laval University, Quebec, QC, Canada, ²Valacta, Sainte-Anne-de-Bellevue, QC, Canada, ³University of Guelph, Guelph, ON, Canada, ⁴Agriculture and Agri-Food Canada Research Centre, Agassiz, BC, Canada.

Increasing longevity in dairy herds is an economic plus for the producers. The public's concern for animal welfare is increasing particularly when tied dairy production is involved. In trying to merge both groups' interests, the objective of this study was to evaluate the link between comfort and longevity. One hundred tie-stall dairy farms located in eastern Canada (60 in Quebec and 40 in Ontario) were enrolled. On these farms, comfort data were collected through 2 on farm visits. Lying time was assessed using accelerometers (HOBO), lameness was determined in stalls using 4 behaviors (edge, weight shifting, rest and unevenness in displacement). Cleanliness and injuries were scored using predetermined charts. Production, reproduction and health data were obtained from DHI agencies (Valacta and Canwest DHI). Pearson correlation coefficients were determined for 17 different variables representing comfort, production, reproduction, and health in regard to longevity (percentage of cows in third lactation or more). The analysis was done for Quebec and Ontario herds separately, and together. Due to the primary exploratory nature of this analysis, the level of significance was set to $P = 0.10$. Variables most related to longevity were average milk fat ($r = -0.20$; $P = 0.047$) and protein yield ($r = -0.20$; $P = 0.045$), age at first calving ($r = 0.17$; $P = 0.086$), heifer/cow ratio ($r = -0.27$; $P = 0.008$), percentage of non-injured cows ($r = -0.19$; $P = 0.065$) and percentage of cows lying between 10 and 14 h/d ($r = 0.21$; $P = 0.036$). The results differ between provinces. For Quebec, milk fat ($r = -0.34$; $P = 0.009$) and protein ($r = -0.35$; $P = 0.007$) percentages, average calving interval ($r = -0.25$; $P = 0.062$) and the heifer/cow ratio ($r = -0.38$; $P = 0.003$) were most related. For Ontario these variables were milk protein yield ($r = -0.32$; $P = 0.048$), calving interval ($r = 0.32$; $P = 0.041$), milk yield ($r = -0.27$; $P = 0.088$) and percentage of non-injured cows ($r = 0.26$; $P = 0.10$). Although production and reproduction variables seem to have an important effect on longevity, results show that there is an association between comfort and longevity and that the factors associated to longevity vary between the 2 provinces we compared.

Key Words: cow, comfort, longevity

TH170 Practices associated with dairy cattle wellbeing on organic and similarly sized conventional dairy herds. M. Bergman*¹, R. Richert¹, K. Stiglbauer², K. Cicconi-Hogan³, M. Gamroth², Y. Schuken³, and P. Ruegg¹, ¹University of Wisconsin Madison, Madison, ²Oregon State University, Corvallis, ³Cornell University, Ithaca, NY.

The objective of this study was to assess management practices associated with dairy animal wellbeing among organic and similarly sized conventional dairy herds. Management information, animal health scores and culling information were collected by study personnel during a single farm visit and over a 120 d period from organic (ORG; $n = 192$); conventional grazing herds (CONGR; $n = 36$); and conventional non-grazing herds (CONNG; $n = 64$). Associations among farm types and (1) each categorical variable were tested with χ^2 , and (2) each continuous

variable were tested with Wilcoxon tests. Farm type was not associated with housing at least one calf in a unit that did not enable turning around ($P = 0.901$). Calf bedding was inadequate on 54% of farms, but was not associated with management type ($P = 0.965$). Organic farmers were more likely to feed preweaned calves starter and hay than conventional farmers ($P < 0.001$). Fewer CONNG herds (14%) used analgesics during dehorning than ORG (34%) and CONGR (28%) ($P = 0.009$). Calves were weaned at an older age on ORG as compared with conventional farms (11.6, 8.3, and 8.0 weeks for ORG, CONGR and CONNG, respectively; $P < 0.001$). Calves were dehorned at an older age on ORG as compared with conventional farms (10.2, 6.1, and 9.7 weeks for ORG, CONGR and CONNG, respectively; $P = 0.03$). At least one cow was scored as having hock lesions on 78%, 92%, and 98% for ORG, CONGR and CONNG, respectively ($P < 0.001$). At least one cow was scored as overconditioned on 70%, 81% and 92% for ORG, CONGR and CONNG farms, respectively ($P < 0.001$). Organic farmers were more likely to treat fewer than 50% of animals with retained placentas, metritis, adult pneumonia and calf pneumonia ($P < 0.003$) than conventional farmers. Culling rates across all farms were 7.4% of adult cows and 4.3% of weaned heifers and were not associated with farm type ($P > 0.089$). Mortality across all farms was 2.5% for adult cows and 2.4% for weaned heifers and was not associated with farm type ($P > 0.207$). In conclusion, several of the selected management practices that affect wellbeing differed among the 3 farm types.

Key Words: wellbeing, organic, conventional

TH171 Effect of meloxicam on gain and inflammatory response of calves castrated by banding post-weaning. B. Whitlock*¹, P. Krawczel², J. Carroll³, N. Burdick Sanchez³, J. Dailey³, J. Daniel⁴, and J. Coetzee⁵, ¹Department of Large Animal Clinical Sciences, College of Veterinary Medicine, The University of Tennessee, Knoxville, ²Department of Animal Science, The University of Tennessee, Knoxville, TN 37996, Knoxville, ³USDA-ARS, Livestock Issues Research Unit, Lubbock, TX, ⁴Department of Animal Science, Berry College, Mt. Berry, GA, ⁵Veterinary Diagnostic and Production Animal Medicine, College of Veterinary Medicine, Iowa State University, Ames.

Castration may detrimentally affect the health and performance of weaned calves, and painful procedures are increasingly becoming a public concern. The objective of this study was to determine the effects of castration (by banding) with or without administration of meloxicam, a non-steroid anti-inflammatory, on performance and inflammatory response in weaned beef calves. Forty-eight (weaned) beef calves [10.0 \pm 0.2 mo old; 304 \pm 6 kg BW] were blocked by age, BW, wither height, scrotal circumference, and source, then randomly assigned to 1 of 3 treatments ($n = 16$ calves per treatment: (1) intact bulls (BULL), (2) castration by banding (BAN), or (3) castration by banding with orally-administered meloxicam (3 mg per kg BW on d 0 and 14; BAN+M). Calves were assigned to 8 pens (2 calves per treatment within each pen) one wk before treatment administration for acclimation to group housing. Body weight and plasma haptoglobin and fibrinogen concentrations were assessed on 0, 3, 7, 14, and 28 d after treatment. Rectal temperature was recorded at 5-min intervals for 14 d by dataloggers fitted to the calves on d 0. Data were tested for effects of treatment, day, pen, and treatment by day interaction using procedures for repeated measures. BULL gained more (0.69 \pm 0.12 kg/d; $P < 0.05$) than BAN (0.15 \pm 0.11 kg/d) or BAN+M (0.14 \pm 0.11 kg/d) over 28 d. There was no effect of treatment ($P = 0.36$) or treatment by day interaction ($P = 0.21$) on mean plasma haptoglobin concentration. There was no effect of treatment ($P = 0.84$) or treatment by day interaction ($P = 0.25$) on mean plasma fibrino-

gen concentration. There was an effect of treatment ($P < 0.001$) and a treatment by time interaction ($P < 0.001$) on mean rectal temperature during the 14 d after treatment administration. Over 14 d, BAN+M had the greatest mean rectal temperature ($39.47^{\circ}\text{C} \pm 0.006^{\circ}\text{C}$), BAN had the second greatest temperature ($39.42^{\circ}\text{C} \pm 0.006^{\circ}\text{C}$), and BULL had the lowest temperature ($39.41^{\circ}\text{C} \pm 0.005^{\circ}\text{C}$). Decreased ADG indicates that castration was painful regardless of pain abatement. Benefits of meloxicam were not evident from changes in growth performance or inflammatory response.

Key Words: calf, castration, anti-inflammatory

TH172 Meloxicam mediates short-term behavioral changes of castrated calves. P. D. Krawczel^{*1}, J. A. Carroll², N. C. Burdick Sanchez², J. W. Dailey², J. A. Daniel³, J. F. Coetzee⁴, and B. K. Whitlock⁵, ¹Department of Animal Science, The University of Tennessee, Knoxville, ²USDA-ARS, Livestock Issues Research Unit, Lubbock, TX ³Department of Animal Science, Berry College, Mt. Berry, GA, ⁴Veterinary Diagnostic and Production Animal Medicine, College of Veterinary Medicine, Iowa State University, Ames, ⁵Department of Large Animal Clinical Sciences, College of Veterinary Medicine, The University of Tennessee, Knoxville.

Castration may detrimentally affect the health and performance of weaned calves and painful procedures are increasingly a public concern. Therefore, practical pain mitigation is critical. The objective was to determine the effects of castration (by banding) with or without administration of NSAID, meloxicam, on the behavior of weaned beef calves. Forty-eight (56 d post-weaning) beef calves [10.0 ± 0.2 (mean \pm SE) mo old; 304 ± 6 kg BW] were blocked by multiple factors then randomly assigned to 3 treatments ($n = 16$ calves per treatment): (1) intact bulls (BULL), (2) castration by banding (BAN), or (3) castration by banding with orally-administered meloxicam (3 mg per kg BW on d 0 and 14; BAN+M). On d -7, calves were assigned to 8 pens (2 calves per treatment within each pen). Behaviors [mean lying time (h/d), mean lying bouts (n/d), and steps (n/d)] were recorded at 1-min intervals for 27 d by dataloggers fitted to the calves on d 0. Data were analyzed using a mixed model in SAS with repeated measures. Over 27 d, bull spent more time lying (13.9 ± 0.6 h/d) compared with BAN (11.9 ± 0.6 h/d; $P < 0.001$) or BAN+M (12.2 ± 0.6 h/d; $P = 0.004$), which did not differ from one another ($P = 0.85$). During the 3 d after each administration of meloxicam, treatment differences were evident among all treatments. BULL spent more time lying (12.9 ± 0.6 h/d) than BAN (9.7 ± 0.7 h/d; $P < 0.001$) and tended to spend more time lying than BAN+M (11.4 ± 0.6 h/d; $P = 0.07$). BAN+M spent more time lying than BAN ($P = 0.02$). Day and treatment by day interactions were evident for both periods ($P < 0.04$). Lying bouts were not affected by treatment over 27 d ($P = 0.23$) or the 3 d after meloxicam ($P = 0.32$). Steps per d tended to differ among treatments ($P = 0.09$); BULL took fewer steps (829 ± 75 n/d) than BAN (991 ± 76 n/d) or BAN+M (972 ± 75 n/d) over 27 d. BULL took fewer steps than BAN (886 ± 80 vs 1133 ± 81 n/d; $P < 0.001$), but did not differ from BAN+M (1035 ± 80 n/d; $P = 0.16$) over the 3 d after meloxicam. Decreased lying and increased steps suggest castration was painful regardless of pain abatement. The benefits of meloxicam were evident from decreased behavioral changes 3 d after administration.

Key Words: calf, castration, behavior

TH173 Lying behavior of indoor-housed dairy goats. G. Zobel^{*1}, K. Leslie², D. M. Weary¹, and M. A. G. von Keyserlingk¹, ¹Animal Welfare Program, University of British Columbia, Vancouver,

BC, Canada, ²Population Medicine, University of Guelph, Guelph, ON, Canada.

Lying behavior is often used to assess the suitability of indoor housing for dairy cattle, but to our knowledge no work has assessed lying behavior of lactating dairy goats housed indoors. The aim of this work was to describe the lying behavior of does on commercial dairy goat farms. Data loggers were applied to the rear legs of 60 Saanen Alpine \times does (DIM: 293 ± 131 d) on 3 farms in southwestern Ontario. The 20 does assessed on each farm were all housed within a single pen, and were milked twice a day. The loggers recorded continuously for 12 d. Analyses were descriptive; results are presented as means \pm SD. Overall, goats spent 12.2 ± 1.7 h/d lying down (farm range = 11.1 to 12.9 h/d, individual animal range = 8.2 to 15.7 h/d). This lying time occurred over the course of 24 ± 7 bouts/d (farm range = 22 to 27 bouts/d, individual animal range = 9 to 43 bouts/d). Lying bouts were categorized as short (≤ 30 min), medium (31 to 90 min) or long (> 90 min). The majority (60%) of the lying bouts were short, averaging 12 ± 2 min/bout. Just 7% of bouts were long, averaging 124 ± 24 min/bout. The percentage of long bouts varied across goats, ranging from 1 to 38%. Total daily lying times were comparable to values reported for dairy cows, but this total is composed of more lying bouts of shorter duration. More work is needed to understanding the significance of variation in lying behavior of indoor-housed dairy goats within and among farms.

Key Words: goat, welfare, data logger

TH174 Effects of housing systems and farrowing crates on the performance of sows and piglets in Korea. J. Y. Lee^{*}, J. H. Jeon, K. H. Park, S. H. Yang, Y. H. Yoo, and J. I. Song, National Institute of Animal Science, Suwon, Korea.

This study was conducted to evaluate the effect of different housing systems on the performances of sows and their piglets during gestation and lactation. A total of 54 sows (Landrace \times Yorkshire) were randomly allocated into 4 treatments. Individual housing in stall and group housing during gestation and conventional and alternative farrowing crate during lactation were 2×2 factorially arranged to set 4 treatment groups. Individual sow was used as an experimental unit. During gestation, sows were housed either in stall individually or in group with electronic sow feeder. The sows were moved from gestation pen to farrowing pen with either conventional or alternative farrowing crates on d 105 of pregnancy. The alternative farrowing crate was designed to reduce crushed piglet and to meet the Korean guidelines for pig welfare certification which states free movement of sow during lactation. Performance measures were taken on sows and piglets. Back-fat thickness and body condition score of sows were not affected by difference of both farrowing crate types and housing systems for pregnant sows. However, the changes in back-fat thickness and body condition score during lactation period were significantly lower ($P < 0.05$) in alternative crate in compared with that of conventional farrowing crate. Feed intake of sows in the group housing was significantly higher ($P < 0.05$) than that of sows in stall during gestation. Although there was no difference of estrus interval of pregnant sows between housing systems, while that was remarkably ($P < 0.05$) decreased in alternative crate compared with in conventional crate. The birth weight of piglets from sows in group housing type was higher ($P < 0.05$) than that from sows in a stall type. Moreover, lower number of still-birth was also observed in alternative farrowing crate. This study showed that the housing systems and the farrowing crate types could affect sow and piglet performances. Moreover, the design of farrowing crate for sow and piglet welfare should be carefully considered through observation of piglet and sow behaviors and performance.

Key Words: sow welfare, group housing, farrowing crate

TH175 Behavior and welfare of intramuscular or subcutaneous injection in finishing pigs and piglets. K. A. Guay* and J. J. McGlone, *Texas Tech University, Lubbock.*

Physical castration (PC), typically performed at approximately 5 d of age, can be stressful for pigs. One alternative to PC is to immunologically castrate (IC), but the stress of the handling associated with immunological castration (or other immunizations) has not been assessed. Our objectives were to determine if subcutaneous (SC) or intramuscular (IM) injections were more painful or stressful than PC for piglets as well as measure the pain and stress associated with receiving a SC or IM injection in finishing pigs. To do this, we ran 2 experiments in which litter served as blocks in this randomized complete block design. After farrowing, 3 to 5 d old male piglets were randomly assigned to nothing (NO), SHAM handling (SHAM), IM, SC or PC with no pain relief. Piglets were videotaped and behavior was sampled for 1 h prior and 1 h post treatment. Behavior monitored included standing, walking, lying, nursing, lying with sow contact and signs of pain (standing hunched over, shaking). Finishing pigs received SC, IM, SHAM or NO injection. Finishing pigs were also monitored for 1 h pre and post treatment, and monitored for eating, drinking, lying, standing, walking, vocalization, open mouth breathing, blotchy skin and signs of irritation (rubbing the injection site). Blood was collected from all pigs for cortisol analysis 60 min post treatments so that the handling of blood collection did not affect the pig behavior. Analysis was in SAS using General Linear Models procedure. PC piglets showed less ($P < 0.05$) lying in contact with sows and more ($P < 0.05$) pain-like behaviors than IM, NO, or SHAM treatments, but SC did not differ from PC. SHAM finishing pigs spent more time lying than the pigs in other treatment groups ($P < 0.05$). Cortisol did not differ among treatments for neither piglets nor finishing pigs. In conclusion, IM injections do not change piglet behaviors relative to no handling or sham handling. SC injections caused a small change in piglet and finishing pig behaviors. PC caused measurable pain-like behaviors and general behavioral dysregulation.

Key Words: castration, injection, pig

TH176 Models for facial recognition and body weight to more precisely provide individual pig care. J. J. McGlone*¹, B. L. Backus¹, K. Guay¹, J. Ao², Q. Wan², B. Nutter², R. Pal², and S. Mitra², ¹Texas Tech University Animal and Food Sciences, Lubbock, ²Texas Tech University Electrical and Computer Engineering, Lubbock.

The US pig industry markets over 110 million pigs a year. An average worker spends only seconds per pig providing pig care. An automated solution that is able to transmit individual pig information to farm management would improve welfare and management at the individual pig level. Our objectives were (1) to develop software for individual pig recognition, and (2) estimate the body weight of pigs using facial dimensions. After weaning, 21 d old, littermate pigs were housed in 4 pens of 10 pigs. Weekly body weights and pictures were taken of each pig. Specific facial features were captured by image analysis. Among several systems tested, the Eigenface algorithm was used to estimate individual pig identity. Each face image in a training set represents a linear combination of the principal components of the distribution of faces. These principal components are called the eigenvectors (displayed as eigenfaces) which characterize the variation in faces from statistical computation of the covariance matrix of a set of the face images

involved. The Eigenface sums the pixels in an image to generate a weighting vector that, with some variation, is unique for that individual. The Eigenface weight vector was calculated for each pig face image and tested to determine if it could reliably identify individuals. If the test image was correctly recognized as the most matched, we called it a 'direct hit'. Cross-validation reached a 72% level of accuracy for 'direct hits'. In the second objective, the mean distance in pixels between eyes for each pig was used to relate to body weight (pig faces grow in proportion to body weight). Over a range of body weights from birth through 100 kg, an exponential curve ($y = 71.97 * x^{1/3}$) described the relationship between the weight of pigs and the distance between the eyes in pixels ($r^2 = 0.9874$); for the narrow weight range of 5 to 42 kg, a linear model ($y = 2.915 * x + 129.5$) described the relationship between distance between the eyes in pixels and body weight ($r^2 = 0.9925$). These early findings will be key components in an automated monitoring system that will have a significant effect on individual pig care.

Key Words: image analysis, pig, animal welfare

TH177 Gait analysis as an objective tool to measure painful and non-painful hoof lameness in multiparous sows. C. Mohling*¹, A. Johnson¹, K. Stalder¹, C. Abell¹, H. Coetzee², S. Millman³, and L. Karriker⁴, ¹Animal Science, Iowa State University, Ames, ²Cyclone Custom Analyte Detection Service, Iowa State University, Ames, ³Veterinary Diagnostic and Animal Production Medicine, Iowa State University, Ames, ⁴Swine Medicine Education Center, Iowa State University, Ames.

Lameness diagnosis using subjective gait scoring may not be repeatable and reliable. Quantitative gait analysis is one tool that might provide objective measures to determine the severity of lameness. The objective of this study was to measure sow gait using quantitative gait analysis technology during painful transient lameness states. Twelve mixed parity sows weighing 228.51 ± 18.08 kg (mean BW \pm SD) were individually housed, and served as their own controls when sound before lameness induction. On d 0, lameness was induced in one randomized rear hoof using a chemical synovitis model. After completion of the first round, sows were given a 7d rest period and then the trial was repeated with lameness induced in the other rear hoof. Three treatment days were compared (1) sound (1 d before induction), (2) most lame (first day after induction of transient lameness) and (3) resolved (sixth day after induction). Sows walked freely in a continuous closed loop track (1 m wide) that transversed across a GAITFour mat (4.3 m with 13,824 sensors). Gait analysis measures collected were maximum pressure (greatest amount of weight placed on a single hoof), stride length (distance in cm between 2 sequential footfalls from the same hoof) and stride time (time in seconds between 2 successive footfalls by the same hoof). Data were analyzed using PROC MIXED, with sow as the experimental unit in a crossover design. Gait analysis measures were compared between the 3 treatment days. On the most lame day, sows exhibited less maximum pressure on the injected hoof ($P < 0.0003$), a shorter stride length ($P < 0.0002$) and a slower stride time ($P < 0.02$) compared with sound and resolved days. There were no differences for these measures between sound and resolved days ($P > 0.05$). There were no differences for maximum pressure, stride length or stride time regardless of round or hoof injected ($P > 0.05$). In conclusion, the GAITFour tool can be considered an objective tool for detecting lameness using differences in pressure, stride length and stride time on days when sows are sound and most lame.

Key Words: gait scoring, lameness, swine