**T56 Weather-related cold stress on conception rates in Sim-Angus cattle.** Jessica A. Stone* and Julie D. Weathers, *Southeast Missouri State University, Cape Girardeau, MO.*

The purpose of this study was to determine how much correlation there was, if any, between temperature, wind chill factor, and pregnancy results. It has been well documented that weather patterns and temperature will affect reproductive efficiency in cattle, as well as other species. The study was conducted in 2013 and again in 2014, using the similar methods. Because of a change in management, 2012 was not eligible for the study because of inconsistency from the following years. The same population of similarly bred Sim-Angus cattle was inseminated using a fixed timed artificial insemination program of a 14-d CO-Synch + CIDR protocol at the David M. Barton Agriculture Research Center in Gordonville, Missouri. In 2013, 41 Sim-Angus cows participated in the study and in 2014, 17 Sim-Angus cows were used. Only 17 were used in 2014 because the entire herd was split equally to create a fall and spring calving herds. By studying the weather patterns 14 d before and after the day of breeding and comparing the pregnancy results of 2013 and 2014, a correlation was found between the temperature, wind chill factor, and pregnancy results ($r = -0.6$). In 2013, the animals were bred on December 6, where the average temperature was −5°C with a wind chill of −12.94°C at 8:53 a.m. In 2014, the day of breeding was December 12, with an average temperature of 3.88°C and a wind chill of 0.05°C at 8:53 a.m. After comparison of blood samples each year for pregnancy (BioPryn; Moscow, ID), 16 out of 41 animals were pregnant in 2013, giving a conception rate of 39%. In 2014 however, 14 of the 17 animals were bred, giving a conception rate of 82%. More research is forthcoming to determine if this correlation holds true for a larger sample of cattle and more repetitions of the experiment.

**Key Words:** conception, cold stress, temperature

**T57 Number of pigs born alive in parity-1 sows associated with lifetime performance and removal hazard in high- or low-performing herds in Japan.** Satomi Tani*, Ryosuke Iida, and Yuzo Koketsu, *Meiji University, Kawasaki, Kanagawa, Japan.*

We compared reproductive performance across parity, lifetime performance and removal hazard of sows in commercial Japanese herds categorized into 3 sow reproductive performance groups and 2 herd productivity groups. The sow group categories were based on the lower and upper 25th percentiles of the number of pigs born alive (PBA) in parity 1, as follows: 8 pigs or fewer, 9–12 pigs and 13 pigs or more. The herds were classified into high- and low-performing herds on the basis of the 50th percentile of pigs weaned per mated female per year. We analyzed 213,514 parity records and 47,024 lifetime records of females entered into 96 herds. Multivariate and single response models were applied to reproductive performance across parity and lifetime performance, respectively, and a proportional hazard model was applied to removal hazard. Sows having 13 or more PBA in parity 1 had 1.0–1.4 more PBA in subsequent parities than sows having 8 or fewer PBA. However, there were no such differences between sow groups for weaning-to-first-mating interval across parity ($P > 0.05$). Also, sows having 13 or more PBA in parity 1 had 3.4–3.7 higher lifetime average PBA than sows having 8 or fewer PBA in both the herd groups ($P < 0.05$). Furthermore, the sows in the low-performing herds with 13 or more PBA in parity 1 also had 2.3 fewer lifetime average nonproductive days than sows having 8 or fewer PBA ($P < 0.05$), although again no similar difference was found for high-performing herds ($P > 0.05$). The removal hazards for a sow having 13 or more PBA in parity 1 were lower than those for a sow having 8 or fewer PBA ($P < 0.05$), with no difference in hazards between the 2 herd groups ($P = 0.62$). In conclusion, PBA in parity 1 can be used to predict a prolific or a low PBA sow. Also, producers in low-performing herds should pay particular attention to sows having low PBA in parity 1 to reduce nonproductive days.

**Key Words:** cohort study, fertile sow, hazard model

**T58 Beneficial effects of a short-term provision of forage to intensively reared broiler chickens.** Oluwaseun S. Iyasere, Toluwatope O. Sodipo, and Anuoluwapo V. Subulokun*, *Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.*

Poultry production plays a major role in bridging the protein gap in developing countries. However, the productivity of poultry in the tropics has been limited by scarcity and high prices of the conventional protein and energy sources. In modern day free-range poultry farming, it is generally assumed that the contribution of foraging to nutritional intake is negligible despite the fact that birds still obtain some of their feed requirements from forage. It became imperative to study the effect of the provision of forage on a short-term to broilers reared intensively on deep litter. Thirty-two 5-wk-old broilers (average weight of 1.2kg) of mixed sex were divided into 2 treatments namely concentrate and concentrate-pasture fed birds, each treatment had 4 replicates. Each replicate of birds were housed in separate pens (1.2 × 2.0 cm). Birds were offered either concentrate (200g) or concentrate-pasture (100 g concentrate and 100 g *Tridax procumbens*) every other day for 30 min. The behavior of the birds was scanned at 5 min interval for 30 min, 4 times a week for 2 weeks and the percentage of birds feeding or drinking was recorded. Feed intake and water intake was monitored during the 30 min period. Weight gain was determined at the end of the 2 weeks experimental period. After checking for normality, data were analyzed using independent *t*-test of SPSS statistical package (version 16). Result showed that a greater percentage of birds offered concentrate displayed higher ($P < 0.001$) drinking behavior and drank more water ($P < 0.001$) compared with birds offered concentrate-pasture. The percentage of birds feeding was greater ($P < 0.001$) in birds offered concentrate-pasture feed than those offered only concentrate feed. In conclusion, a short-term provision of broilers with forage (*Tridax procumbens)* alongside their concentrate feed enhanced their feeding behavior and reduced their concentrate intake by 34% without having a negative effect on their body weight gain. Hence, farmers could consider this as a strategy for conserving their expensive feed resources.

**Key Words:** behavior, body weight gain, broiler

**T59 Inosine 5′-monophosphate increases glutamic acid induced cholecystokinin release from bovine proximal small intestine.** Erin L. Doherty*, Derek W. Brake, and George A. Perry, *South Dakota State University, Brookings, SD.*

Cholecystokinin (CCK) is a hormone secreted by the proximal small intestine and mediates pancreatic exocrine secretions in response to luminal nutrient flows. Glutamic acid and other amino acids can increase secretions of CCK among mice, dogs, and STC-1 cells. Further, inosine 5′-monophosphate (IMP) can increase amino acid induced CCK release from murine proximal intestine. Our objective was to quantify effects of

IMP on glutamic acid induced CCK release from bovine small intestine. Small intestines were collected at slaughter from 2 steers (638 ± 3.2 kg BW) fed a common dry rolled corn-based diet. The small intestine was measured after removal of digesta, and 1-m sections of duodenum, jejunum and ileum were collected. Each small intestinal section was cut longitudinally, rinsed and serosa was removed before collection of mucosa. Mucosal explants (1-cm in diameter) were incubated (37°C) in HBSS (containing 1.26 m*M* $Ca^{2+}$) with 20 m*M* HEPES (pH 7.4) and supplemented with 0, 10, 20, or 30 m*M* glutamic acid and 0 or 2.5 m*M* IMP. After 1 h, incubation buffer was collected, centrifuged to remove cellular debris, and frozen (−80°C) before analyses. Cholecystokinin secretions were quantified by radioimmunoassay. Cholecystokinin release was greater ($P < 0.01$) from duodenum (68.5 ± 5.0 p*M*) than from jejunum (8.5 ± 4.9 p*M*) and ileum (2.3 ± 4.9 p*M*). Release of CCK was 529% greater (glutamic acid × IMP <0.01) when proximal small intestine was supplemented with glutamic acid and IMP (2.79 p*M* CCK released / m*M* glutamic acid) than when proximal small intestine was supplemented with glutamic acid alone (0.53 p*M* CCK released / m*M* glutamic acid). Cursory comparisons to previous data suggest that glutamic acid induced CCK release by proximal intestine is less in cattle than in mice; however, IMP enhanced glutamic acid induced CCK release in cattle to a greater extent than previously reported in mice.

**Key Words:** cattle, cholecystokinin, glutamic acid

**T60 Overexpression and inhibition of specificity protein 1 (SP1) affect milk fat formation in goat mammary epithelial cells.**
Jiangjiang Zhu* and Jun Luo, *Shaanxi Key Laboratory of Molecular Biology for Agriculture, College of Animal Science and Technology, Northwest A&F University, Yangling, Shaanxi, China.*

The objectives of the present study are to explore the function of SP1 in regulating triglyceride accumulation, droplet formation and the expression of genes associated with fat metabolism in goat mammary epithelial cells (GMECs). Adenovirus was used for SP1 overexpression, siRNA and mithramycin A were used for SP1 silencing and inhibition respectively. GC-MS was used for fatty acid composition analysis. Three repeats was used for qPCR and fatty acid determination. Six repeats were used for triglyceride determination and oil red O staining. The results were expressed as mean ± SD. Data of qPCR were analyzed using the $2^{-DDCt}$ method. Group data for multiple comparisons were analyzed by ANOVA followed by Tukey's test. Significance was established at a $P < 0.05$. The results showed that overexpression and interference of SP1, using adenovirus and siRNA respectively, significantly reduced the content of cellular triglyceride and suppressed the accumulation of lipid droplets, and altered the expression of genes related to lipid metabolism. These data indicated that PPARγ and LXRα might have affected the role of SP1 in regulating other genes related to fatty acid uptake (CD36 and LPL), de novo fatty acid synthesis (FASN and ACACA), fatty acid elongation and desaturation (EVOLV6, SCD and FADS2), fatty acid transport (ACSL1, ACSS2 and FABP3), triglyceride synthesis (AGPAT6, LPIN1, DGAT1 and DGAT2), lipid droplet formation and secretion (TIP47, ADFP and XDH), and triglyceride hydrolysis (ATGL and HSL). But expression of SREBP1 was not affected by manipulation of SP1 despite of the crucial role in regulating de novo fatty acid synthesis. To support the results on triglyceride accumulation, adenovirus and mithramycin A, an inhibitor of SP1, was used to treat GMECs. The result showed that, similar to the decrease of triglyceride accumulation, both inhibition and overexpression of SP1 increased the relative content of saturated fatty acids, including C16:0, C14:0 and decreased the content of C18:1 which is important for triglyceride synthesis in GMECs. In conclusion, the findings provide a novel insight of SP1 function in regulating lipid metabolism in GMECs, and also provide novel method for dairy goat breeding.

**Key Words:** dairy goat, specificity protein 1 (SP1), milk fat metabolism

**T61 Effects of plant-derived compounds on *Staphylococcus aureus* infection of primary bovine mammary epithelial cells.**
Ellen V. Valley*[1], Devi Jaganathan[1], Kumar Venkitanarayanan[1], Gary W. Kazmer[1], Lynn Kuo[2], Yu Bo Wang[2], and Kristen E. Govoni[1], *[1]Department of Animal Science, University of Connecticut, Storrs, CT, [2]Department of Statistics, University of Connecticut, Storrs, CT.*

Mastitis is an inflammation of the mammary gland which results in losses to the dairy industry due to discarded milk, poor milk quality and culling. Plant-derived antimicrobials (PDA) have inhibitory effects on *Staphylococcus aureus*, an economically important cause of mastitis, and have less potential to induce bacterial antimicrobial resistance. We hypothesized that (1) eugenol (EG) and *trans*-cinnamaldehyde (TC) would reduce *S. aureus* adhesion to and invasion of primary bovine mammary epithelial cells (MEC), and (2) EG and TC would alter the expression of virulence factors in *S. aureus* and immune response genes in MEC. Mammary epithelial cells were collected from a lactating dairy cow at slaughter and isolated by selective trypsinization. Four strains of *S. aureus*, Thorn 17, S35, M9175, and Thorn 15, were obtained from the Connecticut Veterinary Medical Diagnostic Laboratory. Before inoculation, MEC and *S. aureus* were incubated at 37°C for 12 and 5 h, respectively, with sub-inhibitory concentrations (SIC, concentrations not inhibiting bacterial growth) of EG (0.03%) and TC (0.006%). Mammary epithelial cells were challenged with *S. aureus* in mid log phase and incubated for 2 h at 37°C. To quantify adhesion, cells were washed with PBS to remove unadhered bacteria and lysed with Triton-X. Lysed cells were serially diluted and plated on mannitol salt agar, and colonies were counted after 48 h. To quantify invasion, cells were incubated for 1 h with gentamycin before washing, lysing, and plating as performed for the adhesion assay. Experiments included MEC and *S. aureus* as controls, MEC or *S. aureus* pre-treated with PDA, and MEC and *S. aureus* both pre-treated with PDA (9 treatments). Experiments were performed in duplicate and repeated 3 times. Data were analyzed using PROC MIXED in SAS. For all strains, adhesion was reduced 0.2 to 0.8 $\log_{10}$ cfu/mL ($P \leq 0.05$) and invasion was reduced 1.7 to 3.8 $\log_{10}$ cfu/mL ($P \leq 0.05$). Gene expression analysis is currently underway. In conclusion, SIC of EG and TC effectively reduced *S. aureus* infection of MEC.

**Key Words:** bovine, mastitis, plant-derived antimicrobial

**T62 Extended-spectrum cephalosporin, carbapenem, and fluoroquinolone-resistant gram-negative coliform bacteria present on equine environmental surfaces.**
Rachael Adams*[2], Dixie Mollenkopf[1], Dimitria Mathys[1], Joshua Daniels[1], and Thomas Wittum[1], *[1]The Ohio State University College of Veterinary Medicine, Columbus, OH, [2]The Ohio State University College of Food, Agricultural, and Environmental Sciences, Columbus, OH.*

Antimicrobial resistant bacteria are a rapidly growing concern in human and veterinary medicine. The rising prevalence of extended spectrum β-lactamase (ESBL), AmpC β-lactamase, carbapenemase (CRE), and fluoroquinolone-resistant *Enterobacteriaceae* continually decreases the efficiency of vital antibiotics. Moreover, antibiotic resistant enteric bacteria are zoonotic and can be transmitted between horses and people. Our objective was to evaluate the prevalence of antibiotic resistant bacteria on human contact surfaces in equine environments. Environ-

mental surfaces in 20 Ohio equine barns were sampled using 2 electrostatic cloths (Swiffer), yielding a total of 242 samples. Samples were phenotypically screened for AmpC, ESBL, CRE, and fluoroquinolone resistance using selective media. To select for cephalosporinase phenotypes, samples were incubated at 37°C in nutrient broth with 2 μg/mL cefotaxime. This broth was aseptically inoculated to MacConkey agar with 8 μg/mL cefoxitin, 4 μg/mL cefepime, and 1 μg/mL meropenem to detect AmpC, ESBL, and CRE phenotypes, respectively. Additionally, samples were incubated in nutrient broth with 16 μg/mL naladixic acid and then inoculated to MacConkey agar with 16 μg/mL naladixic acid and 2 μg/mL ciprofloxacin to detect fluoroquinolone resistance phenotypes. Genotypes were confirmed using standard PCR techniques. Of the coliform bacteria isolated from each surface, 49 (24.5%) were cefoxitin resistant, 25 (12.5%) were naladixic acid resistant, 13 (6.5%) were cefepime resistant, and 9 (4.5%) were ciprofloxacin resistant. Drains and wash stalls were most commonly contaminated at 17 resistant isolates, followed by handles of mucky equipment at 15 resistant isolates. These results indicate that equine environmental surfaces are contaminated with resistant bacteria that can potentially be transmitted between human and horse populations. Furthermore, detecting these bacteria on common human contact surfaces suggests that the environment can serve as a reservoir for antibiotic resistance genes. Identifying interventions to lower the prevalence of antibiotic resistant bacteria in equine environments will protect both animal and public health.

**Key Words:** antibiotic resistance, equine, environmental

**T63 Interleukin-6, tumor necrosis factor-α, insulin-like growth factor-1 and fibroblast growth factor-2 alter proliferation and differentiation of equine satellite cells.** Emma K. LaVigne*[1], Alfredo Sanchez Londoño[2], and Sarah A. Reed[1], *[1]Department of Animal Science, University of Connecticut, Storrs, CT, [2]Department of Environmental and Population Health, Cummings School of Veterinary Medicine at Tufts University, North Grafton, MA.*

Muscle growth in young horses occurs by hypertrophy of individual muscle fibers, which can be accomplished through the activation and differentiation of satellite cells. Satellite cells are muscle stem cells that reside between the sarcolemma and the basal lamina of the muscle fiber and can be stimulated or inhibited in response to different cytokines and growth factors. We hypothesized that interleukin (IL)-6, tumor necrosis factor (TNF)-α, insulin-like growth factor (IGF)-1 and fibroblast growth factor (FGF)-2 would alter proliferation and differentiation in satellite cells isolated from young horses. Satellite cells obtained from 10 d old foals (n = 4) were cultured individually in the presence of 10 ng/mL IL-6, 20 ng/mL TNF-α, 25 ng/mL IGF-1 or 10 ng/mL FGF-2 to determine the effects on proliferation and differentiation (3 wells per treatment group per horse). Proliferation was measured by incorporation of 5-ethynyl-2'-deoxyuridine (EdU) into cells in S phase. Differentiation was measured by quantifying the fusion index (the number of nuclei present in multinucleated myofibers divided by the total number of nuclei). Data were analyzed using the MIXED procedure in SAS; $P < 0.05$ was considered significant. Interleukin-6 and TNF-α decreased satellite cell proliferation compared with control cells (14.9% and 11.5%, respectively; $P \leq 0.01$). Fusion into myotubes was increased 6.2% in the presence of IL-6 ($P = 0.001$) but decreased 8.7% by TNF-α ($P < 0.0001$). Satellite cell proliferation was increased 28.8% in the presence of IGF-1 ($P < 0.0001$) and 73.0% in the presence of FGF-2 ($P < 0.0001$) compared with controls. Insulin-like growth factor-1 increased fusion 3.5% ($P = 0.0087$) and FGF-2 decreased fusion 13.1% ($P < 0.0001$). By differentially stimulating or inhibiting proliferation and fusion of satellite cells, IL-6, TNF-α, IGF-1 and FGF-2 significantly affect muscle hypertrophy. Dysregulation of these cytokines or growth factors, therefore, can lead to detrimental muscle degradation, inflammation, and impaired growth.

**Key Words:** satellite cells, horse, inflammation

**T64 Effects of varying anthelmintic formulations on hindgut microflora in horses.** John Rowe*, Katelyn Barnhart, Elizabeth Share, John Mark Reddish, and Kimberly Cole, *The Ohio State University College of Food, Agricultural, and Environmental Sciences, Columbus, OH.*

Horses house a dynamic population of microbes within their hindgut that can be disrupted by diet, stress, and medication. Horses are routinely given anthelmintic drugs to reduce internal parasite loads and although their modes of action are well known, there is a lack of knowledge of their effect on the gastrointestinal microflora in horses. The objective of this study was to monitor changes in hindgut microflora after treatment with 2 pyrantel anthelmintic formulations. Ten non-pregnant Quarter Horse mares (8.0 ± 6.0 yr) were randomly assigned to 1 of 2 treatment groups: Paste or Pellet. Throughout the study, all mares continued to receive their basal diet of 0.5% BW of a 12% CP pelleted concentrate with mixed grass hay and water ad libitum. Mares in the Paste group received one dose (0.9 g per 136 kg BW) of pyrantel pamoate paste. Fecal samples were collected immediately before treatment (d 0) and on d 1, 2, 3, 7, 10, and 14 post-treatment. Mares in the Pellet group received pyrantel tartrate pellets (28.3 g per 113 kg bw) once daily for 14 d. Fecal samples were collected immediately before treatment (d 0) and on d 1, 2, 3, 7, 10, and 14 of treatment as well as d 1, 2, 3, 7, 10, and 14 post-treatment. Pooled fecal samples from d 0 served as the untreated controls. DNA was extracted from fecal samples and subjected to PCR-DGGE with universal primers specific to the V2-V3 region of the 16S rRNA gene. PCR-DGGE images were analyzed with BioNumerics software to generate dendrogram comparisons based on the position and number of bands with further evaluation using principal coordinate analysis (PCA). Dendrograms and PCA revealed clustering by time in both groups indicating that pyrantel anthelmintic treatment influenced hindgut microbial diversity. Additional research identifying specific changes in the microbial profiles is needed to better understand the influence of anthelmintic products on the hindgut microflora of horses.

**Key Words:** equine, microflora, anthelmintic

**T65 Effects of poor maternal nutrition during gestation on protein expression in the liver of lambs.** Katelyn K. McFadden*, Maria L. Hoffman, Kristen N. Peck, Sarah A. Reed, Steven A. Zinn, and Kristen E. Govoni, *Department of Animal Science, University of Connecticut, Storrs, CT.*

Poor maternal nutrition during gestation can reduce growth and circulating growth factors secreted by the liver, as well as alter lipid metabolism; however, the mechanisms involved are not well understood. Previously, we reported that poor maternal nutrition altered liver expression of genes involved in lipid metabolism and the somatotropic axis in the offspring. Therefore, we hypothesized that poor maternal nutrition during gestation would alter expression of key proteins involved in lipid metabolism and the somatotropic axis in the liver of offspring. Multiparous ewes (n = 36) were individually housed and fed 100, 60, or 140% of NRC requirements beginning at d 31 ± 1.3 of gestation. Lambs were euthanized within 24 h of birth (1 d; n = 18) or at 3 mo of age (n = 15). Lambs from ewes fed 100, 60, or 140% will be referred to as CON, RES, and OVER, respectively. At euthanasia, whole livers were harvested, weighed and tissue samples collected. Protein was determined by Western immunob-

lot. Proteins were imaged using an Odyssey CLx Imaging System and quantified using Image Studio Lite program. Data were analyzed using PROC GLM. As previously reported, BW were 13% greater in OVER vs. CON at 1 d and 3 mo. Liver weight was 43% greater in OVER vs. CON at 1 d when adjusted for BW, but not at 3 mo. Based on previously determined changes in gene expression in the liver, sterol-regulatory element binding protein-I (SREBP-I), a regulatory gene of hepatic lipogenesis, IGF binding protein-4 (IGFBP-4) and IGFBP-3 were evaluated. At 3 mo, IGFBP-3 expression increased 16% in OVER vs. CON ($P = 0.03$) and IGFBP-4 tended to increase 88% in RES vs. CON ($P = 0.08$). Maternal diet did not affect protein expression of IGFBP-3 or −4 at 1 d or SREBP-I at either time point ($P \geq 0.11$). The observed increase in IGFBP-3 protein expression in OVER parallels previously determined increases in gene expression and circulating concentrations of IGFBP-3. In conclusion, poor maternal nutrition alters gene, protein, and circulating concentrations of key growth factors, such as IGFBP-3, which may contribute to altered growth of offspring.

**Key Words:** IGF binding protein, liver, maternal nutrition

**T66 Effects of rubber covers for concrete slats on lameness in confined feedlots.** Bryant R. Chapman*, Derrick S. Smith, Colleen N. Curtiss, Monica J. Atkin, Steven R. Rust, and Daniel L. Grooms, *Michigan State University, East Lansing, MI.*

The second most significant health issue for fed cattle in the US is lameness and is viewed as a major welfare issue in animal agriculture. Lameness tends to be more problematic for cattle housed in facilities with slatted floors. The objective of this study was to evaluate the effectiveness of rubber covered slatted floors for reduction of lameness, tail injury incidence, and improvement of overall performance. Angus-based steers (250 to 300 kg) were assigned randomly to pens with non-covered concrete slats (NC;n = 4) or concrete slats covered with rubber (RC;n = 4). Each pen contained 7 steers at a stocking density of 6.9 $m^2$/steer. Cattle were on feed for 110 to 131 d. Locomotion scores, tail lesions, left carpal joint circumference, and hoof dimensions were recorded. Average daily gain, feed conversion efficiency, cleanliness, and carcass traits were collected and reported in a companion abstract. Hide cleanliness was graded on a scale of 0 to 9, with 0 being less than 5% soiled and 9 being completely soiled. Locomotion scores were recorded on a 0 to 3 scale, where 0 was a normal gait and 3 was severely lame. Tail tip injury was recorded on a scale of 0 to 3, where 0 had no visible lesions and 3 had open wounds. Locomotion scores, left carpal joint circumference, and tail lesions did not differ between treatments. The toe length of cattle housed on the RC was longer than NC (77.3 vs. 84.0; $P < 0.01$). A trend for sharper angle of the hoof was observed for cattle on NC compared with RC (55.5 vs. 52.5; $P < 0.16$). A positive correlation was detected between the angle of the front hoof and the carpal joint circumference (r = 0.77; $P < 0.03$). Positive correlations were detected between hide soiling vs. the front toe length (r = 0.71; $P < 0.05$) and angles between the front and rear hooves (r = 0.62; $P < 0.10$). In summary, provision of rubber covers for concrete slats had minor effects on overall cattle lameness.

**Key Words:** lameness, welfare, tail lesion

**T67 Associations between animal performance measures and rumen pH of growing feedlot steers in drought simulated conditions.** Sara E. Place[1], Michelle S. Calvo-Lorenzo[1], Clint R. Krehbiel[1], Christopher J. Richards[1], Douglas L. Step[2], Kristi Allwardt[1], Catherine L. Haviland[1], Emily A. Andreini[1], Jacob Reed[1], Andrew Grimes[1], Ashley Broocks[1], Justin L. Lyles[1], Kyre E. Larrabee*[1], Kimberly Branham[1], Megan M. Rolf[1], *[1]Department of Animal Science, Oklahoma State University, Stillwater, OK, [2]Veterinary Clinical Sciences, Oklahoma State University, Stillwater, OK.*

Located in the drought stricken Southern Great Plains, Oklahoma is an ideal site to investigate the associations between decreased water availability and cattle performance. The objectives of this research were to investigate the effects of restricted water intake (WI) on animal performance, and associations between animal performance and rumen pH. These data are part of a larger 5 yr project that will develop selection and management tools to adapt cattle to drought conditions. The data were collected from 117 cross-bred steers (*Bos taurus*) that were blocked by BW upon arrival to the Willard Sparks Beef Research Center at Oklahoma State University in Stillwater. Steers were housed in 4 identical pens each equipped with an Insentec feed and water intake system consisting of 6 feed bunks and 1 waterer per pen, which allowed for individual DMI and WI collection. Following a 21 d adaptation, a 70 d feed and WI collection trial was conducted to establish baseline WI for each individual steer. Following the 70 d trial, steers had their WI reduced 10% of baseline weekly for 4 wks to achieve a 50% of baseline WI restriction. After 1 wk of adaptation, cattle were maintained at 50% WI restriction for 35 d to simulate reductions of WI due to decreased water quality, quantity, and increased temperature that cattle would experience during drought events. Steers were weighed every 14 d. Prior to and after water restriction, rumen fluid was collected for each steer via rumenocentesis and the pH was immediately measured. Associations between DMI, WI, ADG, and rumen fluid pH before and after water restriction and the effects of water restriction on ADG were investigated using Proc Corr and Proc GLM procedures in SAS (SAS Institute, Cary, NC), respectively. Rumen fluid pH was not associated with any steer performance measures ($P > 0.05$). Water restriction significantly reduced steer ADG and DMI by 23% and 19% ($P < 0.001$), respectively, and rumen pH was increased during restriction ($P = 0.0141$). These data suggest drought conditions negatively affect steer performance, emphasizing the importance of selection and management tools to adapt beef cattle production to drought conditions.

**Key Words:** climate adaptation, drought, cattle

**T68 Macrominerals requirements for growth of Canindé goats.** Luana P. S. Ribeiro*[1], Ariosvaldo N. Medeiros[2], Francisco F. R. Carvalho[3], Elzânia S. Pereira[4], Anaiane P. Souza[5], José Maurício S. Neto[5], Cláudio G. S. Junior[2], Gabriel C. L. Branco[2], and Andreia B. Bezerra[2], *[1]Federal University of Bahia, Salvador, Bahia, Brazil, [2]Federal University of Paraíba, Areia, Paraiba, Brazil, [3]Federal University Rural of Pernambuco, Recife, Pernambuco, Brazil, [4]Federal University Ceará, Fortaleza, Ceara, Brazil, [5]State University Sao Paulo, Jaboticabal, Sao Paulo, Brazil.*

Minerals are important constituents of structural tissues, metabolism and body fluids; however, the mineral nutritional requirements remain poorly quantified in goats. In fact, the values are estimated from other species. Therefore, the objective of this study was to predict the net requirement of Ca, P, Mg, Na, and K for growth of Canindé kids. Thirty 3 castrated kids (15.65 ± 0.41 kg of initial BW) were used, 5 of which were slaughtered at the beginning of the experiment to determine the initial body composition. The 28 remaining goats were distributed in a completely randomized design, kept in individual pens, and fed 4 levels (treatments) of intake: 1) ad libitum (100%), 2) 80%, 3) 60%, and 4) 40%. The diet consisted of 55% forage (Tifton) and 45% concentrate. The goats were slaughtered when the animals fed ad libitum reached 26.55 ± 0.65 kg of BW. The carcasses and organs were weighed, homogenized and sampled

for chemical analysis. A comparative slaughter method for assessing body composition and estimation of nutritional requirements was used (Garret et al., 1959). The data were analyzed by the REG procedure of SAS. Body composition were estimated from the predicted equation obtained by regressing the logarithm of the weight of each mineral in the empty body, for animals with 15 to 25 kg. The values (g kg-1 EBW) for Ca, P, Mg, K and Na ranged from 10.49 to 12.59, 8.08 to 7.16, 0.18 to 0.44, 1.63 to 1.37, and 1.59 to 4.09, respectively. The net requirements for growth were estimated by the first derivative of the allometric equations. The values (g kg-1 EBW) for Ca, P, Mg, K and Na ranged from 10.91 to 13.83, 5.00 to 4.67, 0.36 to 0.93, 1.40 to 1.75 and 3.34 to 9.06, respectively. This study indicates that indigenous goats have lower requirements of Ca, Mg and Na, and greater requirements of P and K when compared with current feeding system recommendations.

**Key Words:** body composition, goat, nutrition

**T69 Back to basics: Are beef cattle good at showing estrus? An assessment of estrus response, length of sexual receptivity, follicular growth, and pregnancy rate in beef cattle following a 5-day CO-Synch + CIDR estrus synchronization program.** Victoria Morrow*, Shannon Edwards, Stephanie Webb, Jeremy Hemmer, Jennifer Bouland, Steve Parish, and Martin Maquivar, *Washington State University, Pullman, WA.*

The development of estrus synchronization protocols that facilitate fixed time artificial insemination (FTAI) in beef cattle has resulted in variable pregnancy rates. This variability has been attributed to different factors such as expression of sexual behavior, and follicular dynamics. The objective of the present study was to assess the onset of estrus response, estrus length, follicular growth, and size at AI using the 5 d-CO-Synch + CIDR program. One hundred and 3 females (81 cows and 22 heifers) were synchronized with an administration of 100 µg of GnRH IM and an intravaginal controlled internal drug release (CIDR) at d −5. At d 0, the CIDR was withdrawn and 2 doses of PGF2-α (25 mg) were administered via IM 6 h apart. Animals were observed continuously for behavioral signs of heat after CIDR removal until either 56 h (FTAI for heifers) or 72 h (FTAI for cows). At AI all animals received 100 µg of GnRH IM. Pregnancy diagnosis was performed approximately 60 d after FTAI. Results were analyzed by PROC MIXED procedure using a 2 × 2 factorial arrangement (pregnancy status and expression of heat). No differences where observed between heifers and cows. Overall, the proportion of animals showing sexual behavior was 45% (46/103), where 22% (10/46) did not get pregnant. No differences ($P > 0.05$) were detected between animals that showed estrus and became pregnant (n = 36) or showed estrus and were non pregnant (n = 10) at onset of sexual receptivity (52:09 h vs 46:30 h) and length of estrus (6:05 h vs 6:36 h) respectively. Non pregnant animals without estrus expression had the smallest follicle size at AI ($P = 0.04$), however no differences were observed in follicular growth. Pregnancy rate at FTAI was similar among animals regardless expression of estrus. In conclusion, the lack of reproductive response in animals submitted to a FTAI synchronization program can be related to a reduction in follicular size at FTAI and absence of estrus behavior.

**Key Words:** estrus expression, beef cattle, reproductive management

**T70 Single nose ringed swine behavior in free-range production system.** Patrícia M. Gomes*[1], Amanda R. R. Cabral[1], Jacqueline N. Paiva[1], Karoline M. Silva[1], Frederico L. Silva[1], Felipe H. Soares[1], Carlos A. Silva Júnior[1], Julia E. G. N. Perini[2], Jessica M. Araujo[1], Angela P. Santana[1], and Luci S. Murata[1], *[1]University of Brasilia, Brasilia, Federal District, Brazil, [2]Brasilia Federal Institute, Brasilia, Federal District, Brazil.*

Single nose ring is commonly used in free-range swine production to control pasture and soil degradation. To evaluate the behavior frequency in multiparous non-pregnant sows, a trial was carried out with 2 treatments, ringed and control, with 4 sows each. The trial was divided based on cicatrization process: inflammation, proliferation and remodeling, during 23 d. The chosen method to evaluate the behavior after nose ring insertion was scan, consisting in observation every 10 min, 6 h a day (morning and evening). Twelve categories of behavior were used in scan sampling: rooting, tree rubbing, tree bark chewing, digging, wallowing, grazing, alert, resting, positive social interaction, negative social interaction, drinking and sniffing. Each group of sows were allocated in a 1000-$m^2$ paddock, limited with solar electric fences, in exotic *B. decumbens* pasture and with push-lever bowl drinker. Sows were fed with commercial regular mash diet twice a day. Results showed that ringed sows spend 60.65% of the time resting, while control group spend 47.46% ($P < 0.01$). Rooting behavior was not observed in the ringed group, whereas control group demonstrated it for 0.63% of the time. Digging was seen in ringed group, in a frequency of 0.24%, and was not observed in control sows. Sniffing in ringed group was seen in 3.52% of the time and 13.17% in the control group ($P < 0.01$). During inflammation phase, rooting, tree rubbing and tree bark chewing were seen in control group (0.57%, 0.43%, 0.14% respectively) and were not observed in ringed group. In proliferation phase the ringed group already showed tree bark chewing and tree rubbing (both with 0.33%) whereas for the control group the frequencies were 0.55% and 0.22% (ns). In remodeling phase control group showed 0.88% for rooting, 0.88% for tree rubbing and 1.1% for tree bark chewing, while ringed sows were not observed with the first 2 behaviors and with 0.22% (ns) of the last. The trial showed that the ring insertion changed the behavior of the sows, resulting in more time resting. Rooting behavior was absent in ringed group during observations and signals of adaptations were seen, because digging was a behavior not seen in control group and present in ring inserted sows.

**Key Words:** sustainability, rooting, welfare

**T71 Conception rates of beef heifers and cows based on facilities.** Miriam A. Snider* and Julie D. Weathers, *Southeast Missouri State University, Cape Girardeau, MO.*

Two breeding experiments conducted over a 2-year period were conducted to determine if conception rates in beef heifers and cows were affected in response to breeding facilities. The study compared the traditional squeeze chute and the insemination barn with timed artificial insemination programs. The heifer groups were given the 14 d CIDR-PG and cow groups the 7 d CO-Synch + CIDR protocol to determine whether conception rates are affected by insemination within a squeeze chute or insemination within an insemination barn. In Experiment 1, 17 beef heifers at the Barton Agricultural Research Center in Gordonville, Missouri were artificially inseminated following standard protocols. Cattle numbers were selected at random to determine which animals would be bred in the insemination barn or within the squeeze chute. Technicians were alternated so that each technician inseminated half of the animals in each facility setting. Ultrasound technology was used to determine which heifers were pregnant. Results indicated that 87.5% of heifers bred in the squeeze chute became pregnant as compared with 37.5% ($P \leq 0.05$) of heifers bred in the insemination barn. Experiment 2 largely consisted of the same process. This time, however, 17 beef cows were inseminated. BioPryn (Moscow, ID) blood tests were used to confirm pregnancy within the cow population 30 d following insemination.

Results indicated that 88.89% of the cows bred in the squeeze chute became pregnant whereas only 75% ($P \leq 0.10$) in the insemination barn became pregnant. This indicates on average a 31.94% ($P \leq 0.05$) higher rate of pregnancy from breeding in a traditional squeeze chute compared with the insemination barn. Future studies will include larger sample sizes of cattle and take into account technician preferences.

**Key Words:** conception, insemination barn, squeeze chute

**T72 A comparison of Dorper and Blackface lambs in growth and carcass performance.** Kayley R. Wall* and Chris R. Kerth, *Texas A&M University, College Station, TX.*

To determine the suitability of a purebred Dorper as a meat animal in a production setting, the growth and carcass traits of Blackface April–born lambs (n = 8) grown on a concentrate diet were compared with Dorper September–born lambs (n = 8). All lambs were fed a concentrate diet (16% CP, 3% crude fat, 9% crude fiber) ad libitum in separate pens for 18 d before the start and for the duration of the study (62 d). The initial (0 d) and final (62 d) BW, percent change in BW, ADG, and G:F were measured. One Blackface lamb died during the feeding trial. All of the lambs were harvested on d 62 and placed into the blast chiller (4°C) for 15 h after hot carcass weights were recorded. Carcass data were collected 16 d postmortem. The carcasses were ribbed and allowed to bloom for 1 h before marbling, fat thickness, LM area, leg confirmation score, KPH %, flank streaking, and lean color (L*, a*, and b*) were collected. Data were analyzed using a one-way ANOVA of a completely randomized design with animal as the experimental unit and α set at 5%. Average daily gain and G:F were not affected ($P > 0.47$) by lamb breed, but percentage change in BW tended ($P = 0.099$) to be higher in Dorper sheep compared with Blackface sheep. Fat thickness, marbling, flank streaking and KPH % were higher ($P < 0.014$) in the Blackface than Dorper lambs. The Blackface lambs also had heavier ($P < 0.001$) live and hot carcass weights than the Dorper lambs; however, there were no significant differences ($P > 0.13$) between the breeds in LM area and dressing percentage, despite the age difference of the lambs. Dorper lambs had lighter (higher L* values; $P = 0.001$) and less red (lower a* values; $P = 0.041$) lean, but b* values were not affected ($P = 0.62$) by breed. Although the Blackface lambs were fatter and had higher BW and HCW compared with the Dorper lambs, they did not outperform them in growth, dressing percent, or LM area. We believe the Dorper could be a suitable competitor to the Blackface in a production system as a meat-producing animal.

**Key Words:** Dorper, lamb

**T73 Gait score of broilers supplemented with vitamin D (25-$OHD_3$).** Grace Alessandra Araujo Baldo*[1], Ibiara Correia de Lima Almeida Paz[1], Edivaldo Antônio Garcia[1], Andréa Britto Molino[1], and Marlon Sávio Amadori[2], *[1]School of Veterinary Medicine of Animal Science, UNESP, Botucatu, SP, Brazil, [2]School of Agricultural Sciences, UFGD, Dourados, MS, Brazil.*

The aim of this study was evaluated the gait score of broilers supplemented with vitamin D. For this, we used 2400 broilers distributed in a randomized blocks allocated in factorial design 2 × 2 × 2, being males and females, strains Cobb 500 and Ross 308, supplemented or not with vitamin D (25-$OHD_3$). The diets were formulated following the requirements of each phase and added to 69 mg of 25-$OHD_3$/t of feed in the supplemented treatments. After 41 d evaluated the gait score and, for this, 100% of the birds were put to walk in the path of a bounded linear meter inside the boxes. The way the birds walked was ranked scores ranging from 0 to 2, being gait score 0 bird that walked normally, gait score 1 bird which was difficult to walk and gait score 2 bird that walked with difficulty. We used the Chi-Square at a significance level of 5%. Females had higher ($P < 0.05$) frequency of gait score 0 (88.41%) and males had a higher frequency of gait score 1 (16.26%). The Cobb 500 strain of birds had higher ($P < 0.05$) incidence of gait score 0 (87.79%) when compared with the Ross 308 (83.10%). Supplementation with vitamin D (25-$OHD_3$) did not affect ($P > 0.05$) the gait score of birds. Therefore, it was concluded that vitamin D (25-$OHD_3$) did not improve the way of walking (gait score) of broilers.

**Key Words:** animal welfare, poultry production, way of walking

**T74 Effects of corn particle size and diet form on nursery pig growth performance.** Ashton D. Yoder*, Grace E. Bokelman, and Cassandra K. Jones, *[1]Kansas State University, Manhattan, KS.*

A total of 180 nursery pigs (PIC 327 × 1050; 36 d of age; initially 16.1 kg) were utilized in a 35-d experiment to determine the effects of corn particle size and pelleting on nursery pig growth performance. All diets were nutritionally similar, but processing parameters created 4 experimental treatments in a 2 × 2 factorial with 2 corn particle sizes (500 µm vs. 750 µm) and 2 diet forms (mash vs. pelleted). Pigs were weaned on d 26 of age, blocked by initial BW, and fed a pelleted acclimation diet for 10 d. On d 0 of the experiment, pigs were randomly assigned to pens in a randomized complete block design with 5 pigs per pen and 9 replications per treatment. Experimental diets were fed in 2 phases: d 0 to 14 and d 14 to 35. Data were analyzed using the GLIMMIX procedure of SAS. Reducing particle size from 750 to 500 µm did not affect growth performance ($P > 0.44$). Pelleting reduced ($P < 0.05$) feed intake compared with feeding mash diets during each phase and overall, but did not affect ADG or G:F ($P > 0.11$). The interaction between particle size and diet form affected G:F from d 0 to 14, where finely ground mash diets or coarsely ground pelleted diets had greater feed efficiency than finely ground pelleted diets or coarsely ground mash diets ($P = 0.04$; 0.72, 0.68, 0.68, and 0.74 for 500 µm mash, 500 µm pelleted, 750 µm mash, and 750 µm pelleted diets, respectively). Additionally, the interaction tended to affect ADG from d 0 to 14 and overall where pigs fed finely ground mash diets had greater ADG than those fed finely ground pelleted diets ($P = 0.06$; 0.46 vs. 0.40 kg/d for d 0 to 14 and $P = 0.10$; 0.53 vs. 0.48 kg/d for d 0 to 35, respectively). However, this was offset by a tendency for the interaction to affect ADFI from d 14 to 35 as pigs fed finely ground mash diets had greater feed disappearance than those fed finely ground pelleted diets ($P = 0.08$; 1.18 vs. 1.08 kg/d, respectively). These findings are similar to recently published research in both nursery and finishing pigs that suggest there is little advantage of pelleting diets with a fine particle size.

**Key Words:** mash, pellet, nursery pig

**T75 Effect of herbal liniment on equine back pain over time: a preliminary study.** Shannon M. Heibeck*[1], Kelly W. Walter[1], Jay A. Altman[2], Brady J. Karren[2], Miriam B. Altman[3], and Kevin K. Haussler[4], *[1]Agricultural Science Department, Truman State University, Kirksville, MO, [2]Arenus, Fort Collins, CO, [3]Organic Exchange Ltd., Fort Collins, CO, [4]Clinical Sciences Department, Colorado State University, Fort Collins, CO.*

Previous research established pressure algometry as a quantitative and repeatable method of assessing induced musculoskeletal back pain in horses; however there is no data evaluating large areas over time in response to pain-mitigating products. Stock-type horses (n = 18) were

used in a completely randomized 44 d trial to investigate the efficacy of an herbal liniment solution to mitigate musculoskeletal back pain. Horses began the study after a 30 d rest and all were maintained in similar daily light work through use in university horsemanship classes and equestrian team practices for the entire 44 d. Horses were randomly assigned to treatment groups which consisted of a commercially available herbal liniment gel solution (SoreNoMore Ultra, Arenus) or a control gel solution (identical gel solution minus active ingredients) applied to the back daily following exercise at 0.02 cc per square cm. Evaluation of back pain was standardized by dividing the back into 4 equal quadrants lengthwise beginning at the highest point of the withers and ending at the sacroiliac joint. Quadrants extended 17.78 cm ventrally from the spine. The third quadrant (on left and right side) was selected as the area of interest and was clipped to maintain consistency over time. Nine data points in this quadrant were selected (top-left, mid-left, bottom-left, top-mid, center, bottom-mid, top-right, mid-right, bottom-right) for weekly evaluation using a force gage pressure meter (by a single nonblinded examiner). A negative pain response was classified as no reaction to the application of 5.9 kg pressure. Data was inverted to create a 0 to 13 pain score based on the amount of pressure applied. Data were analyzed using the PROC MIXED procedure of SAS with main effects tested being treatment, time, and treatment × time interaction. Treated horses decreased mean pain score from beginning to end of trial (2.87 decrease; $P < 0.001$) compared with control horses (0.72 decrease; $P \leq 0.18$). In summary, standardized evaluation procedure using pressure algometry suggests the herbal liniment gel solution was able to mitigate pain response when applied daily over a 44-d period.

**Key Words:** horse, back pain, liniment

**T76 Evaluation of inter-day variation of horses on total fecal collection.** Elizabeth F. Miller*[1], Francesca R. Melgar[2], Trevor D. Morgan[2], Shanna L. Ivey[2], Clint L. Loest[2], Laura M. White[2], and Kelly W. Walter[1], *[1]Agricultural Science Department, Truman State University, Kirksville, MO, [2]Department of Animal and Range Sciences, New Mexico State University, Las Cruces, NM.*

Environmental changes and stress may influence passage rate and therefore digestibility in horses participating in a total fecal collection where they are individually housed and fitted with fecal collection harnesses. Existing equine research methods sections frequently do not include descriptions of adaptation periods to allow horses to acclimate to the potential stressors of total fecal collections. Utilization of collection harnesses and confined housing could impact data collection of horse nutrition trials. Therefore, the objective of the current study is to evaluate inter-day variation of dry matter intake (DMI), output (DMO), and resulting calculation of digestibility (DMD) of horses on a 5-d total fecal collection. Twelve mature Quarter horse geldings (13.8 ± 5.6 y; 514.4 ± 38.9 kg) were utilized in a completely randomized design. Horses were fitted with fecal collection harnesses and housed individually in 3.7 m × 3.7 m stalls with ad libitum access to water and mineral block. All horses were fed 1.85% BW coastal bermudagrass hay (AF; 8.92% CP and 33.47% ADF) and 1 kg (AF) of a pelleted concentrate supplement (divided into 2 equal meals) beginning 21 d before the start of total fecal collection and continuing through the 5 d collection. Individual daily intake was recorded, and fecal weights were obtained every 6-h during each day of collection. Subsamples of feed and feces were obtained to determine dry matter using standard AOAC methods. Individual days of collection were separated by all possible pairwise comparisons using PROC MIXED of SAS. Day of collection affected DMO, with increased DMO on d 1 compared with d 3 and 4 ($P < 0.05$), and a tendency ($P \leq 0.07$) for increased DMO on d 1 compared with d 2 and 5. This suggests the start of fecal collection may have altered passage rate to increase DMO. The differences of d 1 DMO affected calculated DMD between days (d 1 and 3, $P \leq 0.04$; d 1 and 5, $P \leq 0.09$). This highlights the importance of adapting horses to collection techniques before data collection regardless of diet or treatments to be applied, and warrants adequate description within the methods section of research reports.

**Key Words:** fecal collection, horse