

W179 Effects of feed restriction on heat production by mature meat goats. I. Tovar-Luna*, A. L. Goetsch, R. Puchala, and T. Sahu, *E (Kika) de la Garza American Institute for Goat Research, Langston University, OK.*

Fourteen Boer (75%) x Spanish wether goats (51 ± 1.8 kg BW and 23 mo of age) were used to determine effects of a moderate degree of nutrient restriction on heat production (HP). The experiment consisted of a 26-d period (P1) followed by one of 46 d (P2). Wethers were fasted on the final 4 d of each period, with gas exchange measured on the last 2 d. Fasting was preceded by collection of feces and urine for 7 d, with the final 2 d for gas exchange. All wethers were fed a 60% concentrate diet at a level of intake near maintenance in P1 (P1-100 and P1-80 treatments). In P2, six wethers continued on this level of intake (P2-100 treatment); to mimic procedures in a separate experiment, eight wethers also continued at this level for 15 d but then had ME intake sequentially reduced by 10 and 20% for 10 and 21 d, respectively (P2-80 treatment). Dietary ME concentration in period 2 was greater ($P < 0.05$) for 80 than for 100 treatments (13.2 vs 12.4 MJ/kg DM). Intake of ME was lowest ($P < 0.05$) for P2-80 (529, 535, 552 and 474 kJ/kg BW^{0.75} (fasted) for P1-100, P1-80, P2-100, and P2-80, respectively). Fed HP was lowest ($P < 0.05$) for P2-80 (495, 505, 467, and 406 kJ/kg BW^{0.75}), whereas that while fasting was similar among treatments (287, 279, 273, and 253 kJ/kg BW^{0.75} for P1-100, P1-80, P2-100, and P2-80, respectively). The ME requirement for maintenance (ME_m) was greater ($P < 0.05$) in P1 than P2 (477, 487, 421, and 376 kJ/kg BW^{0.75}), and when analyzed for P2 separately ME_m was lower ($P < 0.10$; 374 vs 425 kJ/kg BW^{0.75}) and the efficiency of ME use for maintenance was greater ($P < 0.08$) for P2-80 than for P2-100 (0.689 vs 0.625). In conclusion, moderate feed intake restriction impacted HP by mature meat goats largely via decreasing that associated with or responsive to nutrient intake or workload rather than physiological processes responsible for fasting HP, with a magnitude of change in ME_m 65% of that in ME intake. Supported by USDA Project No. 00-38814-9500.

Key Words: Goats, Energy, Feed Intake

W180 Effects of length of pasture access on energy use by growing meat goats. T. Berhan, R. Puchala*, R. C. Merkel, T. A. Gipson, G. Animut, A. L. Goetsch, and T. Sahu, *E (Kika) de la Garza American Institute for Goat Research, Langston University, OK.*

Six Boer x Spanish wethers (21 ± 1.0 kg BW) were used in two simultaneous 3 x 3 Latin squares to determine effects of different lengths of access to pasture with high availability of cool-season annual forage on energy expenditure (EE), retained energy (RE), ME intake, and grazing behavior. Wethers grazed a 0.7-ha pasture of wheat and rye in the fall/winter period for 4 (1200 to 1600), 8 (0800 to 1600), or 24 h; 4- and 8-h wethers were barn confined at other times. Periods were at least 18 d in length, with 4 d for total feces collection with bags, 2 d to measure heart rate (HR) and grazing behavior, and 1 d without feed or water for assessing body composition from urea space. EE was based on HR and the predetermined relationship between EE and HR for each wether, and ME intake was the sum of EE and RE. Available forage mass averaged 2,831, 2,176, and 2,443 kg/ha in period 1, 2, and 3, respectively. EE was greatest ($P < 0.05$) for 24 h (4.96, 5.13, and 6.19 MJ/d for 4, 8, and 24 h, respectively), although RE was similar among treatments (0.88, 2.16, and 1.57 MJ/d for 4, 8, and 24 h, respectively; SE = 0.361). Intake of ME was greater for 8 and 24 h vs 4 (5.84, 7.30, and 7.76 MJ/d for 4, 8, and 24 h, respectively). Gain of fat (15.7, 50.3, and 33.7 g/d for 4, 8, and 24 h, respectively; SE = 9.80) was responsible for numerically

greatest RE for 8 h, with similar gain of water, protein, and ash. As length of pasture access increased, number of steps (2,508, 4,569, and 6,412), time spent ruminating (4.42, 6.33, and 7.28 h), and time eating (3.77, 6.35, and 7.24 h for 4, 8, and 24 h, respectively) increased ($P < 0.05$). In summary, even though 4-h pasture access limited ME intake and eating time, EE was similar to that for 8 h. Full-day pasture access resulted in greater EE than for 8 h presumably because of differences in behaviors such as eating time and number of steps, yet ME intake was not different. In conclusion, these results suggest that with high availability of high-quality forage, limited pasture access of a minimal length could yield performance by growing meat goats at least comparable to that with continuous access. Supported by USDA Project No. 00-38814-9500.

Key Words: Goats, Grazing, Energy

W181 Effects of pasture inclusion of mimosa on growth by co-grazing goats and sheep. G. Animut*^{1,2}, A. L. Goetsch¹, G. E. Aiken³, R. Puchala¹, G. Detweiler¹, C. R. Krehbiel², R. C. Merkel¹, T. Sahu¹, L. J. Dawson⁴, and Z. B. Johnson⁵, ¹*E (Kika) de la Garza American Institute for Goat Research, Langston University, OK*, ²*Animal Science Department, Oklahoma State University, Stillwater*, ³*USDA ARS Dale Bumpers Small Farms Research Center, Booneville, AR*, ⁴*College of Veterinary Medicine, Oklahoma State University, Stillwater*, ⁵*Department of Animal Science, University of Arkansas, Fayetteville.*

Effects of mimosa alley-cropped in grass/forb pastures on growth performance of co-grazing sheep and goat wethers were determined. Three sheep (Khatadin) and three goats (#8805 75% Boer), with initial BW of 22 ± 1.3 and 21 ± 0.7 kg, respectively, and age of 4 to 5 mo, grazed 0.4-ha pastures of grasses such as bermudagrass and johnsongrass and forbs (e.g., ragweed) for 16 wk. Three pastures with mimosa (3.1 m between rows and 0.46-m interval) and three without (W and WO, respectively) were divided into four paddocks for 2-wk rotational grazing. The number of mimosa trees per pasture averaged 928 and 904 at the beginning and end of the experiment, respectively. Daily mimosa leaf DM removal averaged 25.5 g per animal, although harvest was complete before the end of 2-wk grazing periods. Mimosa leaf samples averaged 2.81, 37.8, and 85.9% N, NDF, and IVDMD (true), respectively. Available forage (grass and forbs) mass was similar ($P > 0.05$) between treatments before (2,928 and 2,695 kg/ha; SE = 183.4) and after grazing (1,507 and 1,452 kg/ha for WO and W, respectively; SE = 140.4). Percentage of grass in forage determined by transect pre- (57.5 and 69.9%; SE = 8.34) and post-grazing (66.3 and 78.8% for WO and W, respectively; SE = 8.09) was not affected by treatment ($P > 0.05$). Pre-grazed forage concentrations of N (1.25 and 1.24%), NDF (64.5 and 63.8%), and IVDMD (52.9 and 56.2% for WO and W, respectively) were similar ($P > 0.05$) between treatments, as was also true post-grazing (N: 1.05 and 0.96%; NDF: 66.3 and 69.4%; and IVDMD: 49.0 and 48.0% for WO and W, respectively). ADG in the first (125 and 119 g/d; SE = 13.0), second (87 and 108; SE = 26.9), third (16 and 44 g/d; SE = 14.6), and fourth 4-wk period (-23 and 0; SE = 27.6) and in wk 1-16 (51 and 68 g/d for WO and W, respectively; SE = 8.6) was similar ($P > 0.05$) between WO and W. In summary, mimosa increased high-quality herbage available for grazing (mimosa leaf) but did not significantly influence growth performance of co-grazing sheep or goats, perhaps because of decreasing availability as 2-wk grazing periods advanced and/or relatively low intake of mimosa leaf. Supported by USDA Project No. 00-38814-9502.

Key Words: Goats, Mimosa, Co-Grazing

Animal Behavior & Well Being

W182 A computerized system for monitoring feeding behavior and individual feed intake of dairy cattle in loose-house conditions. A. Bach*^{1,2}, C. Iglesias², and I. Busto³, ¹*ICREA, Barcelona, Spain*, ²*IRTA-Unitat de Remugants, Barcelona, Spain*, ³*Diputació de Girona, Semega, Girona, Spain.*

The objective of this study was to develop and validate a computerized system to monitor feeding behavior and feed intake of loose-housed dairy cattle. The system consisted of 28 scales located in front of each self-locking place of a regular feed bunk. All cows had access to all scales indifferently. Each visit to the feed bunk was monitored by a transponder in the ear of each cow that was detected by a proximity

reader located at the top right corner of each head-lock. The data from the scales and the proximity readers were continuously recorded by a computer with an average scanning time of 3.5 s. The monitoring system was validated using all 28 feeding places and 51 lactating cows in a series of 5-h observations during 5 different days. During the observation periods two observers recorded the cow number and the exact time of the visit to each scale. The observed data were then compared with the computer records. To validate weight monitorization, on separate days the amount of feed consumed by a cow during a visit was also measured manually with an external scale. The average time spent in a given scale by each cow determined by direct observations was similar

(7 s difference; $P=0.60$) to that determined by the computer. This small difference supports the application of the computerized system to study feeding behavior. Furthermore, the system was accurate and showed a specificity of 98.8% and a sensitivity of 99.6% for cow detections. Feed weights determined by the computer system were similar ($P=0.54$) to those measured manually with an external scale (144 g difference). This implies that the system was also accurate in measuring individual intake weights. In conclusion, the system allows for studying the number of visits per animal, length of each visit, amount of feed consumed per visit and animal, the total amount of feed consumed daily by each animal, and the rate at which animals consume feed.

Key Words: Feeding Behavior, Dairy Cow, Monitorization

W183 A comparison of three animal welfare assessment programs on California dairies. C. L. Stull¹, B. A. Reed^{*2}, and S. L. Berry¹, ¹University of California Cooperative Extension, Davis, ²University of California Cooperative Extension, Orland.

Due to increasing awareness of animal welfare issues by consumers, three voluntary programs have been developed to assess animal welfare on commercial dairies in the US. These programs include Humane Farm Animal Care (HFAC) with minimum standards and a third party audit system, the Dairy Quality Assurance Center and the University of California, Davis (UCD) programs with self-assessments. All three of the welfare assessment programs cover similar topics such as nutrition, housing, handling, and health. However some recommendations and standards vary between the programs. The objective of this study was to compare the three animal welfare assessment programs on commercial California dairies by using a questionnaire, combining specific criteria from each program. The survey was administered to 10 commercial dairies located in the central valley of California. The survey combined 316 statements from DQAC checklist, the UCD assessment, and the HFAC standards. The mean percent (\pm s.d) compliance for the DQAC, HFAC, and UCD programs is 83 ± 8 , 94 ± 3 and $85 \pm 6\%$, respectively. A ranking order from 1 to 10 was assigned to each dairy using the compliance score for the individual assessment program. The comparison between programs of rank order by Spearman correlation statistical analysis was not significant in any comparison indicating that different indices were being measured by each program. The results of this survey indicate that selection of the available assessment programs for animal welfare on the dairy is important in determining the outcomes. A compliance score range for each program should be defined that is considered acceptable to retailers and will assure consumer confidence in dairy food products.

Key Words: Animal Selfare, Dairy Cow, Auditing

W184 Effects of feed barrier design on feeding and social behavior of loose housed dairy cows. M. I. Endres^{*1}, M. A. G. von Keyserlingk², T. J. DeVries², and D. M. Weary², ¹University of Minnesota, St Paul, ²The University of British Columbia, Vancouver, Canada.

The objective of this study was to evaluate the effects of two feed barrier systems on feeding and social behavior of dairy cows. Forty-eight lactating Holstein cows were housed in four pens each with 12 sand-bedded stalls in a free stall barn. Cows were randomly assigned to one of two starting conditions: access to the feed alley via a neck rail or via headlocks in a completely randomized block design repeated over time. Cows were kept on one of the two conditions for 8 d, then switched to the alternative treatment for another 8 d. Feeding behavior was assessed using presence at the feed bunk, scored with scan sampling at 10-minute intervals from 24-h video. These scans were also used to estimate the percentage of cows feeding during the 90-min period following the delivery of fresh feed. Aggressive displacements from the feed bunk were scored continuously from video during these same 90-min periods. Average daily feeding time did not differ ($P > 0.2$) when cows had access to feed via headlocks (271.7 ± 3.8 min per day) compared to the post and rail barrier (277.8 ± 3.8 min per day). There tended ($P = 0.06$) to be a greater percentage of cows present at the feed alley during the 90-min morning period when using the post and rail barrier ($57.0 \pm 1.5\%$) compared with the headlocks ($50.8 \pm 1.5\%$), but there was no evidence of a difference ($P > 0.2$) during the afternoon feeding. There was also no difference ($P > 0.1$) in the number of displacements performed during the 90 min after feeding when the cows had access to the feed via headlocks versus post and rail barrier (0.71 ± 0.14 and 1.10 ± 0.14

displacements per cow per day, respectively). Although the post and rail barrier may allow for greater access to feed during high use periods, these results indicate that the type of feed barrier has no effect on daily feeding times and incidence of aggressive behavior at the feed bunk.

Key Words: Feed Barrier, Feeding Behavior, Dairy Cow

W185 The effect of feed intake levels on behaviors of transition dairy cows. K. J. Daniels*, J. R. Townsend, S. S. Donkin, E. A. Pajor, A. G. Fahey, and M. M. Schutz, Purdue University, West Lafayette, IN.

Our objective was to characterize feeding behaviors of transition cows fed for different intake levels. Thirty Holstein cows were blocked by expected calving date and randomly assigned to treatments. Control cows (CC) were provided feed for ad libitum intake; restricted cows (RC) were fed to 75% of estimated intake; and stuffed cows (SC) were forced through rumen cannulas to 100% of estimated intake. Cows were housed in tiestalls from 28d prior to expected calving and treatments imposed from 15d prior to expected calving through the day of calving. All cows were fed for ad libitum intake post-calving. Cows were video-taped 24 h/d, using time-lapse video recording, during treatments and until 14d after calving. On d -15, -6, -2, 2, 8 and 13 relative to actual calving, durations of standing (S), lying (L), feeding (F), ruminating (R), feeding while standing (FS), ruminating while standing (RS) and ruminating while lying (RL) behaviors were measured. Treatment affected FS (3.40 h for CC, 2.64 h for RC, and 2.98 h for SC; $P<.01$) and F (3.48 for CC, 2.83 h for RC, and 3.05 h for SC; $P<.01$). Treatment by d affected RS ($P<.05$). As cows approached calving, RS was maintained for RC, but increased for CC and SC. Time spent RS decreased dramatically for SC, was maintained for RC, and increased for CC immediately after calving. Differences among treatments after d 2 were not significant. Day affected all treatments for S, FS, L, RL, F, and R ($P<.01$). Time spent S, FS and RS increased prior to calving, decreased immediately after calving and returned to baseline at d 13. Time spent L decreased over the entire time period for all treatments. Duration of R dropped through d 2 then steadily increased for all treatments. Restricting intake levels prior to calving reduced feeding duration, but it also slowed increases in time spent RS compared to CC after calving. Force feeding cows encouraged RS, but RS dropped after calving when force feeding was ended. Restricting intake levels leads to reduced time spent feeding and ruminating while standing after calving.

Key Words: Dairy Cattle, Behavior, Transition

W186 Suckling latency in neonatal Holstein calves. H. E. Carpenter*, J. S. Birney, and K. A. Koudele, Andrews University, Berrien Springs, MI.

Neonatal suckling behavior is critical for calf survival. The objective of this study was to determine if the latency of neonatal calf suckling behavior was correlated with the percentage of inbreeding, calf birth weight, calf gender, difficulty of birth (dystocia), or dams Johnes status. Holstein calves ($n=372$) were evaluated for suckling response when first offered a bottle of warm colostrum. The latency score was on a scale of 1-5: 1=started nursing within one minute, 2=started nursing within 5 minutes, 3=offered bottle again at next regular feeding time and started nursing within one minute, 4= started nursing within 5 minutes, 5= needed to be oro-gastric tube fed at next feeding. Dystocia level was scored 1-4: 1=no assistance, 2=minor assistance, 3=mechanical pull, 4=hard mechanical extraction. The dams Johnes status was either negative or positive. There were 286 calves with a latency score of 1 (77%). There were 86 calves with scores of 2-5 (2=8.6%, 3=10.0%, 4=1.9%, 5=2.7%). No significant difference was found among the groups for birth weight, gender, dystocia score, or dams Johnes status. There was a significant difference between the percentage of inbreeding and latency of suckling score for group 1 vs groups 2-5 ($p=.004$). Calves with the score of 1 had an average inbreeding of 4.8%. Those with a score of 2 or greater had an average inbreeding of 5.4%. Inbreeding percentages were calculated from the Holstein Associations Inbreeding Calculator. The Holstein breed average is 4.5%. The slow-to-nurse calves require more time and effort from the calf feeding staff increasing dairy labor costs. The increased suckling latency of neonatal calves may be an unintended consequence of selection for increased milk production over the past 50 years. The percentage of inbreeding is also of concern not only on how it affects suckling in the neonate but also on other aspects of

cow productivity such as disease resistance, reproductive parameters, and longevity.

Key Words: Calf Suckling Behavior, Inbreeding

W187 Subsequent effects of an environmental enrichment in the early fattening stage of beef cattle on their behavior, physiology and productivity. T. Ishiwata*¹, K. Uetake¹, N. Abe², Y. Eguchi¹, and T. Tanaka¹, ¹*School of Veterinary Medicine, Azabu University, Sagami-hara, Japan*, ²*Faculty of Agriculture, Tamagawa University, Machida, Japan*.

We have reported the effects of an environmental enrichment with a drum can in the early fattening stage of beef cattle (*J. Anim. Sci.* 81 (Suppl. 1), 2003). The subsequent effects of the enrichment in the middle and finishing stage were investigated. Seventy-one Japanese Black × Holstein steers were allocated, in two repetitive experiments, to 3 pens (6.0×9.5 m each): Pen C (control, n=11 and 12) that consisted of a feeding alley for grain feed, a trough for dry hay, a water bowl and resting space; Pen D (n=12 and 12) that a drum can (Φ58×H 90 cm) that contained hay was added to the control pen; Pen GD (n=12 and 12) that a drum can that was put around an artificial turf (30×120 cm) for grooming was added. The drum cans were removed after 5 mo. Behavioral observations were made for 2 h at 10 min intervals after morning and evening feedings for 3 d at 0, 1, 3 and 5 mo after their removal. Jugular vein blood samples were collected and body weight recorded at 1, 3 and 5 mo after their removal. ANOVA, a post-hoc test and a correlation analysis were performed. Although the drum cans had encouraged hay eating during their installation, the number of eating became smallest in Pen GD ($P<0.05$) after their removal. The number of investigating bars became larger in Pen GD than in Pen C, in which more steers had licked bars ($P<0.05$). The number of stand-resting became largest in Pen GD, in which steers had been more active ($P<0.05$). Serum total cholesterol concentrations became higher in Pen D and GD than in Pen C after the removal of the drum cans ($P<0.05$). Beef belly was thicker in Pen D and GD than in Pen C ($P<0.01$). In Pen GD, the number of eating from the drum can ($r_s=0.79$, $P<0.01$) and grooming with it ($r_s=0.63$, $P<0.05$) correlated with beef marbling. Drum cans installed in the early fattening stage sustained positive effects even after their removal and improved the final productivity of beef cattle.

Key Words: Beef Cattle, Environmental Enrichment, Behavior

W188 Effect of increasing sodium bicarbonate proportion in high concentrate diets on performance, intake, water consumption and feeding behavior in finishing beef heifers. L. González*, A. Ferret, S. Calsamiglia, and X. Manteca, *Universitat Autònoma de Barcelona, Spain*.

Four rumen fistulated Holstein heifers (264 ± 12 kg initial BW) were used in a 4 × 4 Latin square design to determine the effect of increasing levels of sodium bicarbonate (0, 1, 2 and 4 %, on DM basis) on performance, intake, water consumption and feeding behavior. Heifers were allowed to consume concentrate and barley straw on an ad libitum basis, which resulted in a mean forage to concentrate ratio of 12 to 88. Behavior was measured by using scan sampling at 5 minute intervals. Linear, quadratic and cubic effects were analyzed with the Type 1 analysis of variance of the PROC MIXED procedure of SAS with animal and period considered random effects. There was a linear decrease in concentrate DMI ($P < 0.05$) and a linear increase in straw DMI ($P < 0.01$) with increasing buffer proportion in the diet, resulting in a linear decrease ($P < 0.10$) in total DM intake. Protein intake had a linear decrease ($P < 0.05$) with increasing buffer proportion, but there was no effect on NDF intake. Average daily gain decreased linearly ($P < 0.05$) with increasing buffer proportion in the diet, from 1.46 to 0.52 kg/d. When water intake was expressed as L/d or % BW, no effects were found, but it increased linearly when expressed as L/kg DM intake ($P < 0.05$). Moreover percentage of total daily water drunk in the morning (from 0830 to 1230) increased linearly ($P < 0.05$) with increasing buffer in the diet. Buffer concentration did not affect feeding behavior. Animals spent 19.4 ± 1.25, 8.9 ± 0.42, 2.5 ± 0.16 and 55.5 ± 1.85 percent of the time ruminating, eating, drinking and resting, respectively. The lack of effect on time spent ruminating with a linear increase in straw intake could be due to a reduced concentrate intake. Results indicate that overdosing

sodium bicarbonate to finishing heifers fed high concentrate diets may result in a decreased DM intake and animal performance.

Key Words: Beef Heifers, Intake Behavior, Sodium Bicarbonate

W189 Can sheep learn to minimize the length of their foraging path? A. J. Rook* and J. E. Cook, *Institute of Grassland and Environmental Research, North Wyke, Okehampton, Devon, UK*.

Sheep exploit spatially heterogeneous food resources by selective foraging at preferred patches. But can they minimise the distance traveled to exploit a given set of patches? We laid out a 10 × 10 grid of bowls at 4m spacing in a bare earth arena, filling each of 10, 20, 30, 40 or 50 bowls with 25g concentrate feed (patches). We used a different dry ewe and different random patch positions for each of 3 replicates of each treatment. Each ewe foraged in the arena for 20 min on each of 5 successive days. We recorded the distance the ewe travelled before finding 5 patches and compared this with the shortest possible distance and with the expectation from a random walk. The distance to 5 patches on day 5 was 0.37 that on day 1 for the 10 patch treatment but only 0.67 for the 50 patch treatment. For the 10 patch treatment the distance on day 1 was 4.59 times the shortest possible path but only 1.78 times by day 5. Values for the 50 patch treatment were 2.11 and 1.38. Even on day 1 distance travelled was significantly ($P<0.001$) shorter than for a random walk as when leaving any bowl (full or empty), ewes continued in the same direction as they had approached it on 64% of occasions. In conclusion after 5 days of learning ewes were close to minimising the distance travelled to find 5 patches. Learning was more marked when the resource was more scarcely distributed. The path taken was always shorter than a random walk.

Key Words: Foraging, Sheep, Optimisation

W190 We have ways of getting you to.... behave! J. K. Haskell* and F. D. Provenza, *Department of Forestry, Range and Wildlife, Utah State University, Logan, UT*.

Our goal is to increase the use of knowledge of behavior to better reconcile ecological, economic, and social facets of management by conducting outreach, education, and research activities that will: (1) improve economic viability and ecological integrity of pasture- and range-based enterprises, (2) enhance and maintain biodiversity of rangelands, (3) restore pastures and rangelands dominated by weeds, (4) optimize wildlife benefits to land owners, managers, and users, (5) mitigate livestock abuse of riparian areas, (6) improve our ability to manage complex adaptive systems. Behavioral principles and practices, once mastered, provide an array of solutions to the problems people face in managing and improving the integrity of the land. Unlike the infrastructure of a ranch such as corrals, fences, and water development, behavioral solutions cost very little to implement and they are easily transferred from one situation to the next. We know the environment interacting with the genome creates behavioral responses. An animals experience of this *in utero* and in early in life is especially critical, and continues throughout life. Thus, animals are in the process of adapting to ongoing changes in social and physical environments every day of their lives. Therefore, those willing to understand how environments interact with the genome to influence behavior, have unlimited potential to shape change. The challenge becomes understanding and applying behavior principles. To further that goal, rather than developing and transferring technology packages, we aim to change, fundamentally, the way people understand and use behavior to manage ecosystems. We want people to realize the power of behavior to transform systems ecologically, economically, and culturally. We are involving producers, land managers, extension, and technical assistance personnel in various education and outreach activities, fact sheets, booklets, videos, slide shows, demonstrations, symposia, workshops, and courses. We also have developed a web site (www.behave.net) in concert with the national Agriculture Network Information Center (AgNIC) - to disseminate information about the project.

Key Words: Animal Behavior, Biodiversity, Foraging

W191 Effects of fescue toxicosis on CYP3A4 in rats at thermoneutrality. R. S. Settivari*, V. C. Dhulipala, P. A. Eichen, L. E. Wax, T. J. Evans, G. E. Rottinghaus, and D. E. Spiers, *University of Missouri, Columbia*.

Fescue toxicosis is caused by the consumption of toxins found in endophyte infected tall fescue. Cytochrome P450 (CYP) enzymes play an important role in Phase I metabolism of many xenobiotics with CYP3A4 being the dominant CYP in liver. The present study determined if rats fed a diet containing infected fescue toxins (E+) induced CYP3A4. Rats (n=24) were implanted with temperature transmitters to measure core temperature (Tc) and activity every 10 minutes during the study. Following an eight day recovery, rats were fed ground endophyte-free (E-) feed for five days. During the five day treatment period, rats were fed ad libitum either an E- or E+ diets (91.5µg EV/kg BW/day). At the end of treatment, rats were euthanized and liver, adrenal, kidney, heart and testis were weighed. Feed conversion efficiency was calculated for both groups. Serum prolactin levels were measured using enzyme immuno assay. Histological sections of liver were analyzed by electron microscopy. Protein levels of CYP3A4 in liver were analyzed using Western blots. E+ treatment lowered body weight, relative liver weight, feed intake, Tc, and serum prolactin levels (P< 0.05). E+ treatment increased relative testes weights (P<0.05) but had no significant effect (P>0.05) on adrenal, kidney and heart weights. Histological section of liver showed numerous vacuolations between the hepatocytes. Feed intake, weight gain and feed conversion of E+ rats began to return to normal levels near the end of treatment. Protein expression level of CYP3A4 was greater (P<0.05) in E+ rats compared to E- group. This may be due to increased expression of CYP3A4 protein, and could reduce levels of E+ toxins and some of the symptoms in E+ rats after the fourth day of treatment. Future studies should evaluate the rate and time course of CYP3A4 induction and activity in rats fed endophyte-infected fescue diet under acute and prolonged heat stress conditions.

Key Words: Fescue Toxicosis, Cytochrome p450, Rat

W192 Dose-response relationship between ergovaline and physiological changes associated with fescue toxicosis. P. A. Eichen*, D. E. Spiers, and G. E. Rottinghaus, *University of Missouri, Columbia*.

Rats fed an endophyte-infected fescue (E+) seed diet experience changes in core temperature, feed intake and weight gain similar to those seen in cattle consuming E+. A study was performed to determine dose differences in response to ergovaline (EV), the primary toxin found in E+ seed, and identify sensitivity of the above parameters. Male rats (n=24) were implanted with telemetric transmitters (Mini-Mitter, Inc.) to record core temperature (Tc), and randomly assigned to either endophyte-free diet (E-) or E+ diet delivering low (30.5µg EV/kg BW/d), medium (61.0µg EV/kg BW/d) or high (91.5µg EV/kg BW/d) levels. Feed intake and body weights were recorded daily. Rats were maintained at thermoneutrality (TN; 21°C) during pretreatment and the first seven days of treatment, followed by seven days of heat stress (HS; 31°C). At the end of HS, all rats were euthanized for measurement of organ weights. Feed intake decreased at TN in all E+ groups compared to E- rats (P<.0001), with a greater reduction in the high compared to low E+ rats (P<.05). During HS, all E+ groups had lower feed intake than E- rats (P<.0001). Maximum reductions in feed intake below pretreatment levels at TN were 47, 42 and 20% for high, medium and low E+ groups, respectively, with additional reductions of 19, 18 and 38% during HS. However, there was recovery of feed intake in both TN and HS periods. Body weights were not different for any treatment group at TN, but rats fed high and medium E+ diets had decreased body weights compared to low E+ and E- groups during HS (P<.002). E+ groups were not significantly different from one another for Tc, so were combined for analysis. There was a treatment by day interaction during HS, with E+ rats displaying a slightly higher Tc (P<.0001). Liver weights, relative to body weights, were decreased in all E+ groups compared to E- rats (P<.0006). These results indicate that feed intake and Tc responses associated with fescue toxicosis are separate events, with feed intake being much more sensitive.

Key Words: Fescue Toxicosis, Heat Stress

W193 Housing effect on behavior and physiology during feed-withdrawal molt in laying hens: furnished cages vs. conventional cages. K. Pohle*¹ and H.-W. Cheng^{1,2}, ¹Purdue University, West Lafayette, IN, ²USDA-LBRU-ARS.

Environmental variations affect an animal's response to a stressor. This study was to examine whether an enriched environment can reduce hens' stress responses during feed-withdrawal induced-molting, which has been identified as a managerial stressor to laying hens. At 19 wk of age, White Leghorn hens were randomly assigned into conventional cages at 6 hens per cage (645 cm² floor space/hen), or furnished cages at 10 hens per cage (610 cm² floor space/hen). Furnished cages contained nests, perches, scratch pads, and dust baths (Big Dutchman, Germany). Feed-withdrawal molt was initiated at 72 wk of age. Feed was withdrawn on Day 0, cracked corn was returned on Day 7, diet was changed to pullet feed on Day 14, then to layer ration on Day 21. Physiological data were collected via blood collection on days -13, 0 (prior to feed withdrawal), 1, 5, 7 (prior to feed return), 14, 35, including serotonin, epinephrine, norepinephrine, dopamine, and corticosterone levels, and hematological parameters. Behavioral data were collected on days 0, 2, 4, 6, 8, 9, and 17 using continuous observation from 0900-0930 and 1430-1500. There were no significant differences between furnished and conventional cages in overall hormone levels and heterophil:lymphocyte ratio during the molting period (ANOVA, P>0.05). Behavioral observations during the feed withdrawal period indicated that hens in conventional cages spent more time sitting on the cage floor than hens in furnished cages (ANOVA, P=0.04). Hens in conventional cages also spent more time inactive than hens in furnished cages (ANOVA, P=0.005). Hens in both conventional and furnished cages increased their time spent preening (ANOVA, P=0.004) and exploratory pecking (ANOVA, P<0.001) following feed withdrawal. In furnished cages, compared to their behaviors before molt, hens increased dust bath usage (ANOVA, P=0.01) during the feed withdrawal period. These results indicate that housing conditions do not fully compensate for the physiological stress induced by feed-withdrawal induced-molt.

Key Words: Molt, Furnished Cages, Welfare

W194 Effects of acute stress on physical and hormonal response in three genetic strains of laying hens. L. Jefferson* and H. W. Cheng, *United States Department of Agriculture, Agricultural Research Service, Livestock Behavior Research Unit, West Lafayette, IN*.

Genetic selection for enhanced production may also affect animals' abilities to cope with stress. In this experiment, the effects of acute stress on physical and hormonal responses were examined in three genetic lines of laying hens: a line selected for high group productivity and survival (KGB), a line selected for low group productivity and survival (MBB), and a commercial line (DXL). All genetic lines were reared in separate cages in two environmentally controlled rooms, at 4 hens/cage (144 in²/hen). At 17 weeks of age, hens housed in one room were transported to a laying facility and re-caged (transport and mixing stress). The re-caging procedure ensured that all hens were unfamiliar, with a single genetic line in the cage. Hens housed in the second room were reared without interruption and served as controls. Both control and stressed hens were sacrificed 24 hours after treatment. Tissue samples and physical characteristics, including body weight, right adrenal gland, and blood, were collected and analyzed for physiological parameters associated with the stress response. There were no significant differences in heterophil to lymphocyte ratios, relative adrenal weights and plasma corticosterone levels among the control hens from all three lines (P>0.05). Compared to their respective controls, the MBB hens tended to have a greater ratio of heterophils to lymphocytes (P=0.06) than the KGB and DXL hens. The relative weight of the right adrenal gland was significantly increased in the KGB hens (P<0.001) but not in the MBB and DXL hens when compared with their respective controls (P>0.05). Compared to the respective controls, plasma corticosterone levels were increased in both KGB hens and DXL hens (P<0.05) but not in the MBB hens (P>0.05). This data supports the hypothesis that genetic selection affects physical and physiological characteristics which may be indicative of animals' abilities to cope with stress.

Key Words: Chicken, Acute Stress, Genetic Selection

W195 Can perches and platforms affect the incidence of gait abnormalities in broiler chickens? C. Falcone*^{1,2}, J. A. Mench², and P. Wakenell³, ¹*Departamento de Psicologia, Universidade de São Paulo, CAPES, Brazil*, ²*Department of Animal Science, University of California, Davis*, ³*Department of Health and Reproduction, School of Veterinary Medicine, University of California, Davis*.

Gait abnormalities affect millions of commercial broilers reared each year. Previous studies demonstrated that exercise can improve bone strength and decrease leg problems. We examined the incidence of gait abnormalities in Ross broilers (N=312) raised in either enriched or standard pens. Enriched pens contained two platforms and two perches. Perches and platforms were 8cm above the floor, and platforms were connected to the feeders so birds had to use them in order to reach the food. The following measurements were taken: gait, measured using the latency to lie (LTL) test, number of jumps (JMP) during the LTL test, final body weight (BW), and the incidences of tibial dyscondroplasia (TD) and femoral head necrosis (FHN). T-tests and chi-square tests were used to compare means and proportions. Final BW (controls 3.01 kg, enriched 2.96 kg) did not differ between treatments ($p=0.139$). Mean LTL was significantly greater for enriched than control birds (403 vs. 274 sec respectively, $p \leq 0.009$). Mean number of JMP was also significantly ($p=0.009$) higher for enriched (1.12) than control (0.77) birds. TD was found in 19% of enriched birds and 14% of control birds, although this difference was not significant ($p=0.297$). FHN was present in 9% of both enriched and control birds ($p=0.869$). Enrichment did not have clear effects on the specific leg problems that we measured. However, low LTL scores are a measure of impaired gait, and these results therefore indicate that enriching the environment to increase exercise can improve the walking ability of broilers. This project was funded by USDA Award No.2001-02498.

Key Words: Broilers, Gait Abnormalities, Enrichment

W196 Evolution of nursing behavior in Meishan-derived and white sows subjected to an auditory stimulus to decrease nursing intervals throughout lactation. C. Farmer* and S. Robert, *Agriculture and Agri-Food Canada, Dairy and Swine R & D Centre, Lennoxville, Canada*.

The impact of playbacks of recorded sow gruntings on the development of nursing behavior in sows from two genotypes was studied. Yorkshire x Landrace (YL; n = 16) and 25% Meishan (MH; n = 16) sows were equally divided in two groups: 1) no playback, and 2) playbacks of recorded sow gruntings at 35-min intervals. Recordings were played from d 110 of gestation until d 27 of lactation. Sow behavior was videotaped for 24 h every four days, from d 6 to 26 of lactation. Playbacks decreased nursing intervals in MH (34.9 vs 38.2 ± 1.1 min) without altering it in YL (37.9 vs 36.5 ± 1.1 min; breed x treatment, $P < 0.05$), yet this effect in MH was likely due to the increased frequency of non-productive nursings seen on d 6, 10 and 14 ($P < 0.05$) in sows subjected to playbacks. In both breeds, the interval between nursings increased ($P < 0.01$) from d 6 (33.7 ± 0.8 min) to 26 (40.8 ± 0.8 min) of lactation, the interval between non-productive nursings remained similar ($P > 0.1$) and sows ended more nursings as lactation advanced ($P < 0.01$). More nursings were terminated by sows in MH than in YL ($P < 0.01$) whereas more nursings were terminated by piglets from YL than MH sows ($P < 0.05$). Playbacks or genotype did not alter the amount of time over a 24 h period that sows spent standing, sitting, lying on the belly or lying with their udder exposed ($P > 0.1$), but sows spent more time sitting, standing and lying on their belly and less time lying with their udder exposed as lactation advanced ($P < 0.01$). Posture changes were more frequent for MH than YL sows ($P < 0.01$) and increased as lactation advanced ($P < 0.01$). In conclusion, the effects of playbacks on nursing behavior varied across genotypes and all recorded sow behaviors changed as lactation advanced. Piglets from MH sows seem to play a greater role than piglets from YL sows in optimizing lactation performances, as suggested by their lower willingness to end nursings.(Thanks to Hypor (formerly Genex Swine Group) for supplying the animals).

Key Words: Nursing Behavior, Meishan, Sows

W197 Trickle versus drop feeding for gilts and sows in gestation crates or pens: reproductive performance and rates of injury. J. McGlone¹, L. Hulbert*¹, J. Dailey², R. McPherson¹, and J. Morrow², ¹*Texas Tech University, Lubbock*, ²*USDA-ARS*.

Sow housing systems and their effects on sow welfare are important to pork producers and consumers. Specifically, we sought to evaluate the effects of trickle feeding (feed delivered over 30 min) vs. drop feeding (feed delivered in a single moment) for PIC-USA Camborough-22 gilts/sows housed in gestation pens (groups of 5) or individual crates. Gilts were randomly assigned to one of the four factorially-arranged treatments. A total of 8 blocks were established. Pregnant gilts all farrowed in standard farrowing crates and then they returned to their same environment for a second complete parity. A total of 188 litters were farrowed from parity 1 and 2 females. Measures included backfat thickness, farrowing rates, numbers of pigs born alive, weaned, stillborn and piglet birth and weaning weights. Sow weights were collected at farrowing and weaning. Sow injuries, wounds and scratches were quantified. No interactions between parity, housing systems or feeding systems were observed. The interaction between housing and feeding systems was significant ($P = 0.01$) for only sow farrowing weights; drop-fed, penned sows were heavier than drop-fed, crated sows while trickle-fed, penned sows were lighter than trickle-fed, crated sows. Penned sows had more ($P < 0.05$) backfat thickness than crated sows. Drop-fed sows weaned pigs were heavier ($P < 0.05$) than trickle-fed sows. All other measures of productivity were not different among treatments. Injuries, wounds and scratches were statistically similar for sows in each treatment group. Drop-fed, penned sows increased backfat thickness compared with crated sows (perhaps being able to huddle, penned sows required less feed), but this effect was eliminated when penned sows were trickle-fed (and energy expenditure may be increased). Farrowing rates were 10% lower among penned than crated sows. We conclude that overall gilt and sow productivity and injury rates were similar for sows in crates and pens, with the exception that farrowing rates may be reduced among sows housed in social groups during gestation.

Key Words: Pigs, Gestation Housing, Welfare

W198 Performance and longevity of gestating sows housed in pens with electronic sow feeder (ESF) and in individual stalls. L. Anil*¹, S. Anil¹, S. K. Baidoo², and J. Deen¹, ¹*Department of Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota, St. Paul*, ²*Southern Research and Outreach Center, University of Minnesota, Waseca*.

A study was conducted at the University of Minnesota Southern Research and Outreach Center, Waseca, MN with 206 sows (body weight 171-259 kg, parity 1-4) housed in four pens (2 mixings per pen at 14 days interval after weaning) with fully slatted floors (12.75m long X 6.75m wide) and a single walk through ESF located at the center of each pen and 176 sows (body weight 140-278kg, parity 1 to 5) housed in stalls (length 200cm X width 60 cm X height 97cm, with fully slatted floors) to compare the farrowing performance and longevity of sows. All the sows stayed in gestation stalls for the first 10 days following weaning before moving to allotted treatments. The means of performance in each group were compared using Independent-samples T test. A higher conception rate compared to sows in pens with ESF (74.76%) was observed in stall-housed sows (81.81%). There was no significant difference in performance between sows housed in pens with ESF and in stalls in terms of litter size, born alive /litter, stillborn /litter and foster-on. Stall-housed sows had significantly ($P < 0.05$) less number of mummies/litter (0.67 vs. 0.86) and higher foster-off (0.67 vs. 0.79) than group-housed sows. Piglet death /litter (1.22 vs.1.58) and pre-weaning mortality (13.16 vs. 16.24) were significantly ($P < 0.05$) lower in group-housed sows. Of the 17 sows removed from the pens with ESF, 11 were removed for lameness. Five sows were removed from stalls including one for lameness. Proportion of sows removed from the pens with ESF was significantly higher ($P < 0.05$) than sows in stalls. Results indicated that group pens with ESF need modification to improve farrowing percentage and sow longevity.

Key Words: Pens with ESF, Gestation Stall, Sow Longevity

W199 Novel arena/object test to assess housing related stress in gestating sows housed in stalls and in pens with electronic sow feeders (ESF). L. Anil*¹, S. Anil¹, S. K. Baidoo², and J. Deen¹, ¹*Department of Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota, St. Paul*, ²*Southern Research and Outreach Center, University of Minnesota, Waseca*.

Novel object/ arena test was conducted on day 108 of gestation among sows housed in stalls (29 sows) and in pens with ESF (36 sows) to assess the fearfulness of sows when exposed to a novel arena and/or novel object as a measure of the housing-related stress experienced by the sows. A completely enclosed rectangular pen (4.78 m X 2.4 m) was divided into 10 equal segments and numbered one through 10. In the middle, opposite from the side of entrance a semicircle of radius 0.5 m was marked off (area A) for placement of the novel object, a fluorescent orange safety cone. The sows were moved into the pen, one at a time directly from their daily environment. The sow was observed for the first two minutes for the areas it entered within the arena. The sow was considered to be in an area if the snout entered the area. The novel object was placed in area A for the next three minutes and the sow was observed. Data on areas entered, time to approach the object, total time spent in the area A, time to first interaction with the object and number of interactions were recorded. The results of the test were compared using independent sample T-test and Kruskal-wallis ANOVA. More stall-housed sows (16) entered the area with novel object than sows housed in pens with ESF (13). Stall-housed sows took significantly less time (72.5 s) to enter the area with novel object than sows from pens with ESF (112.6 s). There was no significant difference among sows from both systems in terms of number of squares entered, time to have the first interaction and number of interactions with the novel object. The results were inconclusive as there was no possibility to account for the excitement in stall-housed sows when they were permitted to have a short walk and in a larger area during the test and the individual differences among sows.

Key Words: Novel Arena/Object Test, Pens with ESF, Gestation Stall

W200 The effect of cold draft on behavior of newly weaned piglets. A. Bruni* and T. M. Widowski, *University of Guelph, Ontario, Canada*.

Adverse barn environments resulting from poor ventilation or improper temperature control are often blamed for the development of vices in pigs. Behavior problems that can develop at weaning include ear biting, navel sucking and belly nosing. While it is evident that cold, drafty conditions can lead to reduced performance and health problems, any relationship with oral/nasal behavior has never been explored. The objective of this study was to determine the effect of cold draft on oral/nasal behavior in piglets weaned at 18-22 d of age. Sixteen Yorkshire piglets were used in each of 5 trials (n=80) comprising 2 pens per treatment and 4 piglets per pen. Piglets were housed in an environmental chamber in which half of the pens could be exposed to cold draft while the other half maintained at recommended temperature and air velocity. Treatment piglets were kept at 27.9 (+0.58)°C except when subjected to 2-one h periods of time-unpredictable draft each day during which temperature was decreased 3°C and air velocity increased to 0.8 m/s at

pig level. Control pigs were kept at 28.1 (+0.63)°C with minimal air movement of <0.3 m/s. Behaviors were observed on d 3, 5, 7, 9, 12 and 15 using scan sampling every 5 minutes for 6 h per day. Overall, piglets exposed to draft spent significantly less time engaged in belly-nosing behavior (0.59 + 0.18%) and more time at the feeder (12.46 + 0.68%) compared to controls (1.32 + 0.34% and 9.46 + 0.69%, respectively; P<0.05). Yet, overall feed intake and growth rates did not differ for the two groups (P>0.05). During periods of cold draft, treatment piglets were more active (17.7 + 0.02%) and spent more time nosing and chewing their pen-mates' ears and tails (1.6 + 0.01%) compared to controls (14.3 + 0.01% and 1.1 + 0.01%, respectively; P<0.05). These results show that exposure to cold draft stimulates nosing and chewing pen-mates' ears and tails but not belly nosing. Adverse environmental conditions may contribute to some oral/nasal behaviors but not others.

Key Words: Piglet Behavior, Belly Nosing, Cold Draft

W201 Analysis of euthanasia and death in swine breeding herds. S. S. Anil*, L. Anil, and J. Deen, *Department of Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota, St. Paul*.

The pattern of sow deaths and euthanasia and the factors influencing the likelihood of sows to be euthanized or to have a natural death among the removed sows in commercial swine breeding herds were analyzed retrospectively, involving 24,017 records of death and euthanasia from 17 herds from 1999 to 2003. Logistic regression models were fitted to analyze the association of euthanasia with production variables, season and remove day. Of all the females died and euthanized, 23.6 % were euthanized and 16.3 % of females were euthanized for painful conditions. Among the sows and gilts those experienced painful conditions, 67.28% and 58.38% respectively were euthanized. The percentage of euthanized sows (5.2) was higher than that of death (3.4) on farrowing day. The euthanasia to death ratio was lower up to 15 days post-farrowing (0.27 on day 15) and then increased with the peak (0.63) during 31 to 35 days post-farrowing. The proportion of deaths was lower during week-ends. As average number of stillborn/litter increased, the likelihood for euthanasia increased among sows (OR 1.067). Sows of parity 1 and 2 were more likely to be euthanized compared to sows of parity >5 (OR 1.121). The odds of euthanasia was less for lactating sows (OR 0.410) than for non-lactating sows. In sows and gilts, the likelihood for those that were never served to be euthanized was higher (OR 2.423 and 1.686 respectively) compared to those served once. The likelihood was lower (OR 0.86) for sows that were served more than once compared to those served once. The likelihood for euthanasia was higher during weekdays (OR 2.824). The farm had a significant influence on the odds for euthanasia. Average number of litters farrowed / year, average number of non-productive days / parity, average number of pigs born alive / litter, average number of mummies / litter and born alive, mummies and stillborn in the removal parity were not significantly (P>0.05) associated with likelihood for euthanasia among sows. The results indicated that sows were at different likelihoods of euthanasia, depending on stage of production. An effort should be made to ensure that care and pain amelioration are available at all stages of production.

Key Words: Euthanasia, Death, Sow

ADSA Growth and Development

W202 Effects of weaning and ionophore on selected blood metabolites and growth in dairy calves. J. L. Klotz* and R. N. Heitmann, *Department of Animal Science, The University of Tennessee, Knoxville*.

Dairy calf weaning is associated with elevated ketone levels in excess of measured rates of utilization in adults and excess concentrations excreted in urine present a potential energy loss. Lasalocid is frequently supplemented as an anticoccidial in calf starters, but in adults is also known to alter molar ratios of ruminal VFA. Jersey bull calves (n = 24) were blocked in groups of two according to birth date and weight and randomly assigned to receive either a commercial pelleted starter (C), or the same diet containing lasalocid (T; 83 mg/kg DM) to examine effects of weaning transition on weight (BW), gain (ADG), and blood glucose, β -hydroxybutyrate (BHBA), non-esterified fatty acids (NEFA), volatile fatty acids (VFA), insulin, and glucagon (GLN) concentrations over 16 wk. From d 3 - 34 all calves were fed milk replacer twice daily, d 35 - 48

received replacer and C or T, and d 49-112 received *ad libitum* C or T. Repeated measures of BW and metabolite concentrations from jugular samples were recorded weekly. Postweaning intake (2.35 vs. 2.34 kg/d; \pm 0.07), ADG (0.78 vs. 0.75 kg/d; \pm 0.03), and feed:gain (3.10 vs. 3.19; \pm 0.11) did not differ between C and T. Glucose and NEFA concentrations did not differ between C and T, but declined with age. Insulin and GLN concentrations did not differ between C and T, but GLN increased with weaning. Total VFA significantly increased following introduction of solid feed at d 35, but there was a 1-wk lag period with T. Acetate and butyrate concentrations were greater in C than T during wk 7 (P < 0.05). Propionate concentrations and acetate : propionate ratios did not differ between C and T. Blood BHBA concentrations were greater in C than T (P < 0.05) during wk 8 and 9 (1.0, 1.1 vs. 0.7, 0.8 mmol/L; \pm 0.1). Consumption of starter with lasalocid delayed peak acetate and