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# ABSTRACTS

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### Breeding and Genetics

**1 Calpastatin and calpain genetic marker influences on shear force in Brahman steers.** D. E. Franke<sup>1</sup>, D. H. Fischer\*<sup>1</sup>, M. G. Thomas<sup>2</sup>, and T. D. Bidner<sup>1</sup>, <sup>1</sup>LSU Agricultural Center, Baton Rouge, <sup>2</sup>New Mexico State University, Las Cruces.

Brahman steers (n = 430) sired by 68 bulls were purchased from 17 purebred Brahman breeders in Louisiana from 1997 through 2001 to feed and collect carcass and tenderness data. As part of an agreement with Bovigen LLC (www.bovigen.com), the GeneSTAR Tenderness panel of genetic markers was tested against Warner Bratzler shear force of steaks aged for 7 (SF7) and 14 d (SF14) from 370 Brahman steers. The tenderness panel consisted of an SNP in the 3' un-translated region of calpastatin (CAST), an SNP in exon 9 of u-calpain (CALP1 316), and an SNP in the intron between exon 17 and 18 of u-calpain (CALP1 4751). Marker genotypic frequencies of CAST were 0.11 for no Stars, 0.46 for one Star, and 0.43 for two Stars, the favorable genetic marker for lower calpastatin level. The two-Star marker at CAST significantly reduced calpastatin enzyme level, SF14 (P < 0.05) and SF7 (P < 0.10). Genetic marker frequencies for CALP1 316 and CALP1 4751 were zero for the homozygous favorable genotype, 5 and 9 percent for the one-Star genotypes and 95 and 91 percent for the no-Star genotypes, respectively. Individual CALP1 genetic markers (CALP1 316 or CALP1 4751) did not reduce SF7 or SF14. Combinations of favorable alleles from CAST and CALP1 316 reduced SF14 (P < 0.05) but not SF7. Likewise, combinations of favorable alleles from CAST, CALP1 316, and CALP1 4751 reduced SF14 (P < 0.05). Assuming equal influence of individual genetic markers on tenderness, the regression of SF14 on the number of favorable alleles (Stars) when genetic markers were combined was  $-0.104 \pm 0.047$  kg per favorable allele in these cattle. The greatest number of favorable alleles for the three genetic markers in this sample was four, two from CAST and one each from CALP1 316 and CALP1 4751. The expected reduction in SF14 from a combination of marker genotypes with no favorable alleles to a combination of marker genotypes with four favorable alleles would be -0.416 kg. These results indicate that genetic markers associated with shear force may be useful in improving tenderness in Brahman cattle populations.

**Key Words:** Brahman, genetic markers, shear force

**2 Genomic comparisons of bovine CYP3A28 of Angus, Brahman, and reciprocal crosses and milk characteristics.** S. Reiter\*<sup>1</sup>, M. Larson<sup>1</sup>, R. Okimoto<sup>2</sup>, M. Brown<sup>3</sup>, H. Brown, Jr.<sup>1</sup>, Z. Johnson<sup>1</sup>, and C. Rosenkrans, Jr.<sup>1</sup>, <sup>1</sup>University of Arkansas, Fayetteville, <sup>2</sup>Cobb-Vantress, Siloam Springs, AR, <sup>3</sup>USDA/ARS, El Reno, OK.

Cytochrome P450s are a group of heme-containing monooxygenases necessary for the oxidative metabolism of foreign biological substances. Our goal was to determine the frequency of single nucleotide polymorphism (SNP) 994 in the CYP3A28 sequence of three breed types of cattle. The distribution of genotype among the breed types was compared to productivity traits while on endophyte-infected tall fescue as a means of investigating the interaction of cow genotype and ergot alkaloids. Genomic DNA was evaluated in 121 cows; the breed groups were Angus (n = 28), Brahman (n = 33), and Angus Brahman reciprocal crosses (n = 60). Specific primers for bovine CYP3A28 were used for PCR amplification (P450F: CAACAACATGAATCAGC-CAGA; P450R: CCTACATTCCTGTGTGTGCAA) of a 565 base segment. Cytochrome P450 PCR products were then sequenced in 16 animals to establish the SNP and determine genotype. Restriction fragment length polymorphisms (RFLPs) using the Alu I restriction enzyme were used to determine the remainder of the genotypes. Results indicate that polymorphism distribution was associated (P < 0.05) with breed lineage. Angus cows were 61 % heterozygous while 64 % of Brahman cows were homozygous cytosine. Milk volume, butterfat percent, and milk protein percent were affected (P < 0.07) by interactions of forage, genotype, and month of sampling. The number of somatic cell counts in milk was not affected (P > 0.2) by our CYP3A28 polymorphism. Our results indicate that SNP 994 in the CYP3A28 gene was related to milk production by beef cows. Additional analyses are necessary to determine if the polymorphism is associated with cattle susceptibility to ergot alkaloid poisoning.

**Key Words:** Cytochrome P450, cattle, genomics

**3 Relationship between single nucleotide polymorphisms in the bovine heat shock protein 70 gene and milk characteristics of beef cows.** M. Lamb<sup>1</sup>, R. Okimoto<sup>2</sup>, M. Brown<sup>3</sup>, H. Brown, Jr.<sup>1</sup>, Z. Johnson<sup>1</sup>, and C. Rosenkrans, Jr.\*<sup>1</sup>, <sup>1</sup>University of Arkansas, Fayetteville, AR, <sup>2</sup>Cobb-Vantress, Siloam Springs, AR, <sup>3</sup>USDA/ARS, El Reno, OK.

Heat shock proteins (HSPs) are induced by various stressors such as heat, cold, toxins, and oxygen deprivation. Our objective was to determine the genetic diversity in a segment of the HSP-70 gene of cattle. Genomic DNA was collected from 157 cows. The cows were Angus (n = 42), Brahman (n = 41), and Angus Brahman reciprocal crosses (n = 74). Specific primers for bovine HSP-70 (HSP1778F: CGCTGGAGTCGTACGCCTTC; HSP2326R: CTTG-GAAGTAAACAGAAACGGG) were used for PCR amplification of a 523 base segment (based on GenBank accession number U09861). The PCR product was sequenced in both directions. Eight single nucleotide polymorphisms (SNPs) were identified. The SNPs were located at base position 1851 (n = 7; 4.5 %), 1899 (n = 1; 0.64 %), 1902 (n = 6; 3.8 %), 1917 (n = 6; 3.8 %), 1926 (n = 6; 3.8 %), 2033 (n = 22; 14 %), 2087 (n = 10; 6.4 %), and 2098 (n = 6; 3.8 %). Two SNPs were associated with altered milk characteristics. Cows that were heterozygous (CG) at the 2033 base had fewer ( $P < 0.05$ ) somatic cells in their milk than homozygous GG cows (111 vs 305 x 1000 / mL). Cows that were homozygous at the 1902 base had greater ( $P < 0.05$ ) percentages of butterfat and milk protein. These results indicate that the HSP-70 gene in cattle is polymorphic and related to milk characteristics. Polymorphisms within the HSP-70 gene may be useful as a tool in selecting superior cattle.

**Key Words:** HSP-70, cattle, genomics

**4 Evaluation of temperament and production traits of beef replacement heifers.** S. M. DeRouen\* and G. E. Reger, Louisiana State University Agricultural Center, Homer.

The objective of this study was to assess temperament and production traits for Angus-sired (AN; 1/2 Angus, 1/4 Brahman, 1/4 Hereford; n=40) and F<sub>1</sub> Brahman-Hereford (BH; n=50) heifers. Temperament traits obtained were chute score (CS; 1=calm to 5=berserk) and chute exit velocity (EV; m/s). Heifers were evaluated for CS and EV at weaning, at the beginning and end of spring breeding season, and in the fall. Heifer breed type was included as a fixed effect; sire within sire breed and year were included as random effects. All CS and EV were similar ( $P > 0.16$ ) among AN and BH heifers. Correlations among CS and EV measurements were positive and important ( $P < 0.04$ ) except for associations involving fall EV. Heifers were classified as slow (<2.00 m/s), medium (2.00-3.00 m/s), or fast (>3.00 m/s) based on EV values. Slow heifers, when measured at weaning, were heavier ( $P < 0.05$ ) at beginning of breeding and tended to have higher ( $P < 0.10$ ) postweaning gains compared with fast heifers. Slow heifers, when measured at beginning of breeding, were heavier ( $P < 0.05$ ) at the beginning of breeding and in the fall, tended to have higher ( $P < 0.10$ ) body condition scores at the beginning of breeding and had higher ( $P < 0.05$ ) postweaning gains than fast heifers. Slow heifers, when measured at the end of breeding, were heavier ( $P < 0.01$ ) than medium and fast heifers in the fall and had higher ( $P < 0.05$ ) postweaning gains than fast heifers. Pregnancy rate did not differ ( $P > 0.52$ ) among slow, medium, and fast heifers. Pregnant BH heifers tended to have lower EV than open BH heifers at weaning (2.25 vs. 3.11 m/s;  $P < 0.10$ ) and at the end of breeding (2.27 vs. 3.04 m/s;  $P <$

0.10). Chute score when measured at the end of breeding and in the fall tended to be lower ( $P < 0.08$ ) for pregnant BH heifers than for open BH heifers. No differences in EV and CS were detected ( $P > 0.17$ ) among pregnant and open AN heifers. Individual sire least squares means did not differ ( $P > 0.18$ ) for any of CS and EV measurements. In conclusion, these results indicate some important associations of temperament traits with growth and reproductive performances of beef replacement heifers.

**Key Words:** beef heifers, production, temperament

**5 Sire effects and phenotypic variation for temperament scores and fecal egg counts in Angus cattle.** A. H. Brown, Jr.\*, T. A. Yazwinski, Z. B. Johnson, J. G. Powell, J. L. Reynolds, S. T. Dewey, and C. W. Rowe, University of Arkansas, Division of Agriculture, Fayetteville.

Spring born purebred Angus calves (n = 127) were used to study temperament and internal parasite resistance/susceptibility at two locations. Calves were chute scored, weighed, measured, and fecal sampled at weaning in the fall of 2005 and 2006. At weaning (d 0) each calf received fenbendazole at the rate of 10 mg/kg BW. Chute scores were determined on a scale of 1 to 5 with 1 being extremely docile and 5 being berserk frenzy. Calves were the progeny of 14 sires; New Design 878 was the common sire among the locations participating under objective 3 of the southern regional project S-1013. Data for analysis were BW, hip height, chute score, and fecal egg counts determined at d 0, 21, 66, 111, 156, 201, and 246. Strongyle and *Nematodirus* egg counts were normalized with a log 10(X + 1) transformation. Data were analyzed with mixed model procedures. Included in the model were the fixed effects of year, location, sex, sire, age of dam, day, location x day, age of dam x day, and sex x day interactions. The animal was considered a random effect. Day was included as a repeated effect and age of calf (day) was included as a covariate. Coefficients of correlation were calculated among all traits. The interactions of location x day, and sex x day were significant for chute score, log strongyles and log *Nematodirus*. The interaction of age of dam x day was non-significant for all traits. There were no differences ( $P > 0.05$ ) among sires for chute score, but sire effects were significant for log strongyles ( $P = 0.01$ ) and log *Nematodirus* ( $P = 0.06$ ). Age of dam was significant for log strongyles, but not for log *Nematodirus* and chute score. Chutes scores were correlated with day 21 BW (-0.34,  $P = 0.01$ ) and hip height (-0.29,  $P = 0.01$ ). These data suggest that individual animal variation exists for calf temperament and internal parasite resistance/susceptibility in this sample of Angus cattle.

**Key Words:** beef cattle, temperament, internal parasites

**6 Sire effects on liveweight, temperament, and parasite resistance traits in Angus replacement heifers.** W. Wyatt\*<sup>1</sup>, J. Miller<sup>2</sup>, D. Franke<sup>2</sup>, and D. Blouin<sup>2</sup>, <sup>1</sup>Louisiana State University Agricultural Center, Jeanerette, <sup>2</sup>Louisiana State University Agricultural Center, Baton Rouge.

Weanling Angus heifers from the 2003 (n = 38), 2004 (n = 27), and 2005 (n = 41) spring calf crops were used to estimate sire variances and effects and heritabilities for fecal egg counts and behavioral traits. Heifers were administered (day 0) a fenbendazole drench (10 mg kg<sup>-1</sup>) on October 10, 18, and 31 of their respective birth year. A total of 13

Angus sires were used in the study. Liveweights were obtained on days 0, 46, 96, 133, 181, 228, and 270 in year 1; days 0, 120, 143, 190, 220, and 275 in year 2; and days 0, 45, 90, 136, 183, 224, and 261 in year 3. Fecal samples were obtained on days 0, 46, 96, and 181 in year 1; days 0, 143, 190, 220, and 275 in year 2; and days 0, 45, 90, 136, 183, 224, and 261 in year 3 and evaluated for fecal nematode egg counts (eggs/g). Fecal egg counts were transformed (logarithmic, base 10 scale). Chute temperament scores (1 = calm and 5 = berserk frenzy) were assessed on days 0, 181, 228, and 270 in year 1; days 0, 143, 190, 220, and 275 in year 2; and days 0, 90, 136, 183, 224, and 261 in year 3. Chute exit velocities (m/sec) were determined on days 0, 181, 228, and 270 in year 1; days 0, 143, 190, 220, and 275 in year 2; and days 0, 45, 90, 136, 183, 224, and 261 in year 3. The statistical model included year and sample day as fixed effects, with sample day treated as a repeated measure within each heifer. Sire and sire within year were included as random effects and variance components were estimated. Sire variances, approximate heritabilities, and the minimum and maximum sire solutions were  $34 \pm 281$ , 0.17, -2.8, and 4.0 for liveweight;  $0.006 \pm 0.025$ , 0.07, -0.04, and 0.06 for transformed fecal egg count;  $0.015 \pm 0.04$ , 0.10, -0.1, and 0.1 for chute temperament score; and  $0.003 \pm 0.05$ , 0.01, -0.004, and 0.058 for chute exit velocity. These preliminary estimates of sire variances and approximate heritabilities, as derived from a sire model, suggest that the traits studied were little affected by genetic variation. Additional data will be collected in subsequent years and will contribute to a much larger data set (regional project S-1013) for further analyses.

**Key Words:** sire effects, temperament, parasites

**7 Comparison of Florida-born, embryo-derived Angus calves sourced from Kansas and Florida herds on measures of performance, disposition, and body temperature from birth to weaning.** J. D. Arthington<sup>\*1</sup>, D. G. Riley<sup>2</sup>, C. C. Chase<sup>2</sup>, D. O. Rae<sup>3</sup>, J. L. Griffin<sup>4</sup>, and S. W. Coleman<sup>2</sup>, <sup>1</sup>University of Florida –IFAS, Range Cattle Research and Education Center, Ona, <sup>2</sup>USDA, ARS Subtropical Agricultural Research Station, Brooksville, FL, <sup>3</sup>University of Florida, College of Veterinary Medicine, Gainesville, <sup>4</sup>Reproductive Technology International, Plant City, FL.

Florida's beef industry ranks first in the US for the number of ranches exceeding 500 cows. Angus bulls are commonly imported into Florida from northern states to supply the demand for herd sires. The objective of this study was to investigate the performance of two Angus genotypes derived from frozen embryos that were gestated in Brahman x British crossbred cows in south Florida. One genotype was derived from a Kansas herd and represents genetics that are considered modern in the Angus industry. The second genotype was derived from the USDA-ARS Station in Brooksville, FL and represents a mostly closed herd of Angus cattle that have been reared in Central Florida for over 60 years. A total of 81 calves were generated over three consecutive years comprising 16 and 20 Florida bulls and heifers and 26 and 19 Kansas bulls and heifers, respectively. Birth weight did not differ among genotypes ( $28.2 \pm 0.16$  kg). Although age at weaning did not differ ( $267 \pm 4$  d), Kansas calves had a greater ( $P < 0.01$ ) hip height (109 vs. 105 cm; SEM = 0.74) and tended ( $P = 0.09$ ) to have a greater body weight (229 vs. 217 kg; SEM = 4.9) at weaning compared to Florida calves, respectively. Three disposition scores collected at weaning (chute exit velocity and chute and pen temperament score) did not differ ( $P > 0.14$ ) among genotypes. Tympanic temperatures collected over three consecutive July days revealed no differences ( $P > 0.36$ ) among genotypes (average daily low and high tympanic

temperatures =  $38.5 \pm 0.11$  and  $40.9 \pm 0.07$  °C, respectively). A hair coat score (1 to 5 scale; 1 = slick haired and 5 = excessive unshed hair) was collected at weaning and did not differ among genotypes (2.8 vs. 2.4 for Florida and Kansas calves, respectively; SEM = 0.33). Relative to calf performance, lowered body temperature during the summer, hair coat length, or disposition, these results suggest that there are no apparent differences due to the origin (temperate vs. tropical environment) of Angus embryos when gestated and reared to weaning in south Florida.

**Key Words:** calves, tropical, embryo

**8 The relationship of dam efficiency and calf performance to weaning in a commercial cowherd.** S. T. Dewey<sup>\*1</sup>, C. W. Wall<sup>2</sup>, M. L. Looper<sup>3</sup>, C. R. Rosenkrans, Jr.<sup>1</sup>, A. H. Brown, Jr.<sup>1</sup>, and Z. B. Johnson<sup>1</sup>, <sup>1</sup>University of Arkansas, Fayetteville, <sup>2</sup>Arkansas Cooperative Extension Service, Van Buren, <sup>3</sup>USDA/ARS, Booneville, AR.

Crossbred calves (n = 384) were studied across five years to determine sire breed and dam breed effects for calf performance to weaning in a commercial cow herd in west central Arkansas. Calf breeds included Angus (AN) x AN (n = 62), Charolais (CH) x CH (n = 3), AN x CH (n = 109), CH x AN (n = 30), CH x Crossbred (CR) (n = 67), AN x CR (n = 89), AN x Hereford (H) (n = 7), and CH x H (n = 17). Dams (n = 158) were measured for hip height (DHH) and weighed (DWW) at calf weaning. Calf traits of birth weight (BR), average daily gain (ADG), weaning weight (WW), hip height (HH), body condition (WW/HH), and muscle thickness scores (MTS) were determined. Dam efficiency (WW/DWW) was also determined. Data were analyzed with mixed model procedures. The model included the fixed effects of sex, dam breed, sire breed, and the interaction of dam breed by sire breed and random effects of dam. Year was a repeated measure, and age of dam was a covariate for all traits. Age of calf was a covariate for calf weaning traits. The relationship between dam efficiency and calf condition was determined by regression analysis. The model used for the regression included year, sex, and age of dam. The interaction of sire breed by dam breed tended to affect ( $P < 0.10$ ) HH and DHH. Sire breed of calf affected BR ( $P < 0.01$ ), HH ( $P < 0.01$ ), MTS ( $P < 0.01$ ), ADG ( $P < 0.05$ ), and WW ( $P < 0.05$ ). Sex of calf was significant for BR ( $P < 0.01$ ), ADG ( $P < 0.01$ ), WW ( $P < 0.01$ ), HH ( $P < 0.01$ ), WW/HH ( $P < 0.01$ ), and WW/DWW ( $P < 0.01$ ). Age of dam influenced WW/HH ( $P < 0.01$ ), ADG ( $P < 0.05$ ), WW ( $P < 0.05$ ), WW/DWW ( $P < 0.01$ ), WW/DWW ( $P < 0.01$ ), and DHH ( $P < 0.01$ ). Dam breed was significant for DWW ( $P < 0.10$ ). The coefficient of regression of WW/DWW on WW/HH was 2.0419 ( $P < 0.01$ ). These results suggest that more efficient dams produce calves with greater estimated body condition.

**Key Words:** beef cattle, dam efficiency, calf performance

**9 Preweaning performance of calves from tropically-adapted and temperate sires and Brangus cows managed on two forage systems.** M. A. Brown<sup>\*1</sup> and D. L. Lalman<sup>2</sup>, <sup>1</sup>USDA-ARS, Grazinglands Research Laboratory, El Reno, OK, <sup>2</sup>Oklahoma State University, Stillwater.

Four years of preweaning data on 511 calves from 187 Brangus cows and 129 Bonsmara, Brangus, Charolais, Gelbvieh, Hereford, and Romosinuano sires were used to determine sire breed, sex, and age of dam differences under two preweaning forage systems (native tallgrass

rangeland vs improved warm-season forages). Calves were weighed within 24 h of birth, bull calves banded, and calves were not creep-fed. Calves were weaned in the fall at an average of 209 d. Sire breed differences in birth weight differed across forage ( $P < 0.05$ ) with Romosinuano calves on improved forages heavier than counterparts on native rangeland ( $P < 0.01$ ). Calves from mature cows were heavier on native rangeland than counterparts on improved forages ( $P < 0.01$ ) while calves from younger cows tended to be similar on both forage systems or heavier on improved forages. Calves from Bonsmara and Brangus sire calves were heavier in 205-d weaning weight on native rangeland than improved forages ( $P < 0.05$  and  $P < 0.10$ ) whereas there was little evidence of forage differences in calves from other sire breeds. Forage differences in favor of native rangeland were evident in 205-d weights of calves from four- and five-yr old cows ( $P < 0.05$  and  $P < 0.10$ ) but not in calves from two- and three-yr old cows. Heifer calves were heavier at 205-d on native rangeland than heifers on improved forage ( $P < 0.05$ ) while steer calves were similar on both forage systems. There was a trend for weaning condition score from Bonsmara sired calves to be higher ( $P < 0.13$ ) on native rangeland than improved forages whereas Charolais sired calves had higher weaning condition scores on improved forages than native rangeland ( $P < 0.01$ ). These results provide evidence of non-additive relationships between preweaning management systems, sire breed of calves, age of dam, and sex of calf in preweaning traits. Consideration should be given to appropriate combinations of these effects in development of preweaning systems.

**Key Words:** beef cattle, tropically adapted, preweaning

**10 Tropically adapted F1 beef female and location influences on early performance.** D. E. Franke\*<sup>1</sup> and L. V. Cundiff<sup>2</sup>, <sup>1</sup>LSU Agricultural Center, Baton Rouge, LA, <sup>2</sup>USDA/ARS US Meat Animal Research Center, Clay Center, NE.

The continued evaluation of tropically adapted breeds is necessary to find the optimum breed combinations for commercial cow-calf production in the Southern Region. First-cross heifers sired by Beefmaster (BM), Bonsmara (BO), Brangus (BR), and Romosinuano (RO) sire breeds and out of Angus and MARC III dams at the US Meat Animal Research Center in Clay Center NE (NE), were divided equally after weaning with half shipped to the LSU Agricultural Center in Baton Rouge LA (LA) in 2001 and 2002. A total of 202 heifers were shipped over the two-year period. Heifers at both locations were exposed as yearlings to MARC III bulls selected for easy calving. Yearling and two-year-old data were of interest in this study. Female breed of sire influenced ( $P < 0.01$ ) 400d weight, age and weight at puberty, and birth and 205d weight of MARC III-sired calves. Location influenced ( $P < 0.05$ ) 400d weight, weight at puberty, % unassisted births, weaning rate, and calf birth and 205d weight. Female breed of sire x location interactions ( $P < 0.05$ ) were found for age at puberty, % unassisted births, and for 205d weight. Bonsmara-, BR- and RO-sired heifers reached puberty earlier in LA whereas BM-sired heifers reached puberty earlier in NE. Beefmaster-, BO-, and BR-sired females had higher % unassisted births in LA. Weaning rates were 9.8 % higher in NE ( $P < 0.01$ ) and were 77.2 for BM-, 73.5 for RO-, 71.2 for BO-, and 63.2 % for BR-sired females overall. Birth weights of calves from BM-, BO-, and BR-sired females in NE were similar (35.2 to 36.2 kg) and heavier than calves from RO-sired females (32.6 kg). Birth weights of calves from tropically adapted F1 cows were 1.8 kg heavier in NE. Adjusted 205d weights were 30 kg heavier in NE ( $P < 0.01$ ). Advantages for 205d weights of calves in NE over those in LA were

40.9 kg for BR-, 36.2 kg for BM-, 23.5 kg for BO-, and 19.3 kg for RO-sired females. The greatest effects appeared between locations and favored the NE environment.

**Key Words:** breed type, location, maternal performance

**11 Heterosis for reproductive traits in young F<sub>1</sub>, Romosinuano, Brahman, and Angus cows.** D. G. Riley\*<sup>1</sup>, C. C. Chase, Jr.<sup>1</sup>, S. W. Coleman<sup>1</sup>, and T. A. Olson<sup>2</sup>, <sup>1</sup>USDA, ARS, Brooksville, FL, <sup>2</sup>University of Florida, Gainesville.

The objective of this research was to estimate heterosis for reproductive performance of young cows that were produced by matings of Romosinuano (R), Brahman (B), and Angus (A) bulls and cows. Cows ( $n = 659$ ) were spring-born in 2002 to 2005. After weaning, they were placed with bulls until confirmed pregnant. After their first calving, cows were exposed to bulls each spring for 90-d breeding seasons. All F<sub>1</sub> cows were with bulls of the other (third) breed. Purebreds were with bulls of the other two breeds (one-half with each). Cows that calved and those that later weaned a calf were given values of 1; otherwise 0. Calf crop born and weaned (separate analyses within cow ages), and age in days at first calving were evaluated. Fixed effects included breed of cow's sire and dam and their interaction, year, source of A sire (within herd or outside). Sire within sire breed and cow within sire were random effects. Three-yr-old cows sired by industry A bulls were higher in calf crop born by 0.17 than cows sired by Brooksville A bulls ( $P = 0.05$ ), otherwise, source of A sire was not important. Means for age at first calving ranged from  $394 \pm 16$  (A-sired heifers out of B dams) to  $621 \pm 17$  d (B purebreds) and heterosis estimates were -47 (9%), -80 (14%), and -102 (18%) d for RA, RB, and BA, respectively ( $P < 0.004$ ). Heterosis for calf crop born ranged from 7 to 26% (higher than purebred averages) for all pairs of breeds as 2-yr-olds, and from 13 to 43% for 3-yr-olds. Brahman-Angus heterosis was  $0.17 \pm 0.07$  (21%) as 4-yr-olds and RB heterosis was  $0.25 \pm 0.08$  (32%) as 5-yr-olds ( $P < 0.009$ ). Heterosis estimates for calf crop weaned were large, and ranged from 16% (2-yr-old RB) to 77% (3-yr-old BA) of purebred averages. For age at first calving, and calf crop born and weaned, though not always significantly different, BA heterosis estimates were largest, RB estimates were intermediate, and RA estimates were lowest. Heterosis may be most influential on reproductive performance of 3-yr-old cows. Romosinuano crosses displayed substantial heterosis for these traits.

**Key Words:** heterosis, reproduction, Romosinuano

**12 Comparison of F1 cows sired by Brahman, Boran and Tuli bulls for reproductive, maternal, and cow longevity traits.** S. F. Cunningham\*, A. H. Maiga, J. O. Sanders, and A. D. Herring, Texas A&M University, College Station.

Birth weight (BWT) ( $n = 1277$ ) and weaning weight (WWT) ( $n = 1090$ ) of calves, calf crop born (CCB) ( $n = 1386$ ), calf crop weaned (CCW) ( $n = 1294$ ), cow weight at palpation (CW) ( $n = 1474$ ), and cow body condition score (BCS) ( $n = 1473$ ) were evaluated from 1994 to 2006 in 143 F1 cows sired by Brahman (B), Boran (Bo) and Tuli (T) bulls and born to Angus and Hereford cows. Mouth scores (MS) ( $n = 139$ ) were assigned to the remaining cows in 2004 and 2005. Fixed effects included sire breed of cow, dam breed of cow, and calf birth year/age of cow; random effects included cow and sire of cow. BWT and WWT, as traits of their dams, were evaluated using the same model adding

gender for both and age for WWT. All two-way interactions were tested for significance. Calf birth year/age of dam was significant for all traits ( $P < 0.05$ ) except weaning weight. BWT for calves out of B, Bo and T F1 cows were 35.1, 34.8 and 34.9 kg, respectively, and were not different. WWT differed ( $P < 0.05$ ) for calves out of F1 B, Bo and T cows (235.9, 221.1 and 208.4 kg, respectively). CCB (0.881, 0.931, 0.890, respectively) and CCW (0.848, 0.898 and 0.869, respectively) did not differ among B, Bo and T F1 cows. CW in the year of 2000 (cows were 8 or 9 years old) was 600.8, 514.6 and 513.1 kg, respectively, for the F1 cows sired by B, Bo and T, with those sired by B being heaviest ( $P < 0.05$ ). BCS for B-, Bo- and T-sired cows was 5.23, 5.48 and 5.18, respectively, with Bo-sired cows having highest

scores ( $P < 0.05$ ). Higher MS ( $P < 0.05$ ) were assigned to Bo- and B-sired cows (0.95 and 0.94, respectively) compared to T-sired cows (0.78), when both broken and solid incisors were scored as 1, and smooth scored as 0. When both smooth and broken were scored as 0, and solid scored as 1, higher scores ( $P < 0.05$ ) were assigned to B- (0.53) compared to T-sired cows (0.24), the Bo-sired cows being intermediate. Mature size was more moderate and reproductive rates tended to be higher for Boran-sired cows, but Brahman-sired cows weaned heavier calves.

**Key Words:** tropically adapted breeds, cow productivity, longevity

## Extension

**13 Self assessment of Arkansas' producers with small cow-calf herds.** T. R. Troxel<sup>\*1</sup>, R. Poling<sup>1</sup>, S. Eddington<sup>2</sup>, and T. Justice<sup>2,3</sup>, <sup>1</sup>University of Arkansas, Little Rock, <sup>2</sup>Arkansas Farm Bureau, Little Rock, AR, <sup>3</sup>Arkansas Beef Council, Little Rock, AR.

Arkansas producers with small cow-calf herds ( $\leq 50$  cows) were surveyed to determine current strengths and limitations, future opportunities and threats, educational opportunities and methods, demographics, industry memberships and perception of the Beef Checkoff. Extension agents submitted 621 names of which 100 were randomly surveyed (survey response rate = 73.5%). Respondents placed a high value on lifestyle associated with cattle production. High prices were a current strength but management was based more on heritage and family legacy than profitability. Rising production costs and a decreasing opportunity to buy land were current threats. Improved production efficiency was a future opportunity. Increasing land prices for small herds jeopardizes their future lifestyle. Respondents had strong concerns about cost of production and economies of scale. They were interested in production management systems and reported tremendous opportunity to improve but economics alone does not impact their decisions. Genetics, production management in a system approach, and resource stewardship were educational opportunities. On a scale of 1 (not preferred) to 5 (highly preferred), newsletter ( $4.4 \pm 0.72$ ;  $\mu \pm SD$ ) and printed publications ( $4.1 \pm 0.95$ ) were the most preferred educational delivery methods. Respondents rated their knowledge and approval of the Beef Checkoff  $2.8 \pm 0.88$  (1 = no knowledge to 4 = very knowledgeable) and  $3.9 \pm 0.97$  (1 = strongly disapprove to 5 = strongly approve), respectively. Forty-two percent were over 60 yr of age, and 57.7% reported more than 20 yr experience. Sixty-six percent, 64.8% and 2.8% were members of the Arkansas Cattlemen's Association, Arkansas Farm Bureau and National Cattlemen's Beef Association, respectively. This information can assist educators on identifying topics and educational methods to reach producers with small cow-calf herds.

**Key Words:** small cow-calf herds, strengths, limitations

**14 Self assessment of the Arkansas beef cattle support industries.** T. R. Troxel<sup>\*1</sup>, R. Poling<sup>1</sup>, T. Riley<sup>1</sup>, and T. Justice<sup>2,3</sup>, <sup>1</sup>University of Arkansas, Little Rock, <sup>2</sup>Arkansas Farm Bureau, Little Rock, AR, <sup>3</sup>Arkansas Beef Council, Little Rock, AR.

Arkansas beef cattle support industries were surveyed to determine the current strengths and limitations, future opportunities and threats,

educational opportunities and methods, demographics, industry memberships and perception of the Beef Checkoff. The support industries included veterinarians, sale barn operators, animal health representatives, loan officers and insurance agents. Extension agents submitted 278 names of which 100 were randomly surveyed (survey response rate = 54.1%). The support industries see themselves as primary component of producer education addressing public health and food quality concerns and defend economic and social values of the system. Producers with small cow-calf herds were not as involved as producers with large cattle herds making them a difficult audience. Consolidation limits producer interaction. Communication within and between the industry and the consuming public and introducing technology and directing research are future roles. Future threats were uninformed public, fuel, land and regulatory costs, decreased competition, and industry consolidation. No educational opportunities were identified. On a scale of 1 (not preferred) to 5 (highly preferred), newsletter ( $3.9 \pm 1.04$ ;  $\mu \pm SD$ ), printed publications ( $3.6 \pm 1.12$ ), and on-farm demonstrations ( $3.5 \pm 1.08$ ) were the most preferred educational delivery methods. The respondents rated their knowledge and approval of the Beef Checkoff  $2.7 \pm 0.78$  (1 = no knowledge to 4 = very knowledgeable) and  $3.8 \pm 0.81$  (1 = strongly disapprove to 5 = strongly approve), respectively. Fifty-six percent were  $\leq 50$  yrs of age and 56.0% had more than 20 yr experience. Sixty-four percent, 57.7% and 2.9% were members of the Arkansas Cattlemen's Association, Arkansas Farm Bureau and National Cattlemen's Beef Association, respectively. This information can assist educators on identifying topics and educational methods to reach this segment of the industry.

**Key Words:** beef cattle, support industries, educational opportunities

**15 Self assessment of Arkansas' producers with large cow-calf herds.** T. R. Troxel<sup>1</sup>, B. L. Barham<sup>\*1</sup>, R. Poling<sup>1</sup>, and T. Justice<sup>2,3</sup>, <sup>1</sup>University of Arkansas, Little Rock, <sup>2</sup>Arkansas Farm Bureau, Little Rock, AR, <sup>3</sup>Arkansas Beef Council, Little Rock, AR.

Arkansas producers with large cow-calf herds ( $> 50$  cows) were surveyed to determine current strengths and limitations, future opportunities and threats, educational opportunities and methods, demographics, industry memberships and perception of the Beef Checkoff. Extension agents submitted 504 names of which 100 were randomly surveyed (survey response rate = 70.0%). Marketing, climate, land resources, economies of scale, and availability of by-products for feed or fertilizer were cited as current strengths. Current limitations were input costs, market volatility, loss of export markets, urban

sprawl and environmental regulations and activist groups. Production technology to increase production efficiency, maximizing forage growth and utilization, and cattle genetics were listed as future opportunities. Increased cost of production threatens future profitability. Animal health and disease, property tax assessment, and potential loss of consumer confidence were recognized as future threats. Educational opportunities included marketing, input costs, public confidence in the beef cattle industry and environmental issues. On a scale of 1 (not preferred) to 5 (highly preferred), newsletter ( $4.4 \pm 0.86$ ;  $\mu \pm SD$ ) and printed publications ( $4.1 \pm 0.99$ ) were the most preferred educational delivery methods. Respondents rated their knowledge and approval of the Beef Checkoff  $3.0 \pm 0.58$  (1 = no knowledge to 4 = very knowledgeable) and  $4.1 \pm 0.95$  (1 = strongly disapprove to 5 = strongly approve), respectively. Forty-three percent were over 60 yr of age and 82.9% had more than 20 yr experience. Eighty-three percent, 78.6% and 17.1% were members of the Arkansas Cattlemen's Association, Arkansas Farm Bureau and National Cattlemen's Beef Association, respectively. This information can assist educators on identifying topics and educational methods to reach this segment of the industry.

**Key Words:** large cow-calf herds, strengths, limitations

#### 16 Self assessment of the Arkansas stocker cattle industry.

T. R. Troxel<sup>1</sup>, K. S. Lusby<sup>2</sup>, J. T. Richeson<sup>\*1</sup>, R. Poling<sup>1</sup>, and T. Justice<sup>3,4</sup>, <sup>1</sup>University of Arkansas, Little Rock, <sup>2</sup>University of Arkansas, Fayetteville, <sup>3</sup>Arkansas Farm Bureau, Little Rock, AR, <sup>4</sup>Arkansas Beef Council, Little Rock, AR.

Arkansas stocker cattle producers were surveyed to determine the current strengths and limitations, future opportunities and threats, educational opportunities and methods, demographics, industry memberships and perception of the Beef Checkoff. Extension agents submitted 242 names of which 100 were randomly surveyed (survey response rate = 64.0%). Geographic location related to feeder calf supply and demand, climate conditions, growing season, infrastructure, low cost feed ingredients and poultry litter for fertilizer were cited as advantages. Input costs, cattle health, lack of cattle uniformity and small margins were current limitations. Improving calf quality and grouping cattle into uniform groups were identified as future opportunities. Producers did see an opportunity to build alliances and enhance Arkansas' beef cattle reputation. Production costs, environmental regulations, animal rights/environmental issues, urban sprawl, animal disease and volatile markets were future threats. Educational opportunities included cattle health and production costs. On a scale of 1 (not preferred) to 5 (highly preferred), newsletter ( $4.4 \pm 0.82$ ;  $\mu \pm SD$ ) and one-on-one consultation ( $4.0 \pm 1.06$ ) were the most preferred educational delivery methods. Respondents rated their knowledge and approval of the Beef Checkoff  $3.1 \pm 0.72$  (1 = no knowledge to 4 = very knowledgeable) and  $4.1 \pm 1.06$  (1 = strongly disapprove to 5 = strongly approve), respectively. Thirty-three percent were over 60 yr of age and 72.1% had more than 20 yr experience. Eighty percent, 78.7% and 23.0% were members of the Arkansas Cattlemen's Association, Arkansas Farm Bureau and National Cattlemen's Beef Association, respectively. This information can assist educators on identifying topics and educational methods to reach the stocker cattle segment of the beef industry.

**Key Words:** stocker cattle, strengths, limitations

#### 17 Self assessment of the Arkansas purebred cattle industry.

T. R. Troxel<sup>1</sup>, M. S. Gadberry<sup>\*1</sup>, J. T. Richeson<sup>1</sup>, R. Poling<sup>1</sup>, and T. Justice<sup>2,3</sup>, <sup>1</sup>University of Arkansas, Little Rock, <sup>2</sup>Arkansas Farm Bureau, Little Rock, AR, <sup>3</sup>Arkansas Beef Council, Little Rock, AR.

Arkansas purebred cattle producers were surveyed to determine the current strengths and limitations, future opportunities and threats, educational opportunities and methods, demographics, industry memberships and perception of the Beef Checkoff. Extension agents submitted 287 names of which 100 were randomly selected to receive a survey (survey response rate = 70.2%). The industry identified its strength as the genetic resource to improve cattle genomics and adopting carcass quality, product consistency and EPD's technology. Other strengths were production and marketing environment, climate, and cow-calf customer base. The value commercial producers place on herd sires was a current limitation. Future opportunities were genetic advancements and education focusing on genetic value and performance and EPD's selection. Future threats were profitability, environmental issues, urban sprawl, consumer confidence, disease outbreak, border closures, and animal rights groups. Increasing the cow-calf producer's knowledge level for improved genetics, producing calves with greater demand, paying more for quality genetics and consumer confidence were cited as educational opportunities. On a scale of 1 (not preferred) to 5 (highly preferred), newsletter ( $4.3 \pm 1.08$ ;  $\mu \pm SD$ ) and printed publications ( $4.1 \pm 0.78$ ) were the most preferred educational delivery methods. Respondents rated their knowledge and approval of the Beef Checkoff  $3.0 \pm 0.77$  (1 = no knowledge to 4 = very knowledgeable) and  $4.1 \pm 0.97$  (1 = strongly disapprove to 5 = strongly approve), respectively. Thirty-four percent were over 60 yrs of age and 70.3% had more than 20 yr experience. Seventy-four percent, 66.7% and 16.7% were members of the Arkansas Cattlemen's Association, Arkansas Farm Bureau and National Cattlemen's Beef Association, respectively. This information can assist educators on identifying topics and educational methods to reach this segment of the industry.

**Key Words:** purebred cattle, strengths, limitations

#### 18 Extension response to drought conditions affecting livestock operations.

J. Parish<sup>\*1</sup>, J. Rowntree<sup>2</sup>, J. Anderson<sup>1</sup>, C. Navarre<sup>2</sup>, M. Howell<sup>1</sup>, and S. Seal<sup>1</sup>, <sup>1</sup>Mississippi State University Extension Service, Mississippi State, <sup>2</sup>Louisiana State University Agricultural Center, Baton Rouge.

The occurrence of widespread and extended drought conditions in Mississippi (MS) and Louisiana (LA) in 2006 following the devastating hurricane season of 2005 highlighted the need for timely, effective disaster response in Extension programming. The objective of this effort was to summarize the scope and methods of the Extension drought response for livestock production in MS and LA. Rapid response to initial drought concerns was deemed a high priority for MS and LA Extension livestock programs due to heightened disaster awareness and lingering disaster impacts. Media utilized to rapidly disseminate information to livestock producers in MS and LA included traditional face-to-face meetings, interactive video conferencing, websites, podcasts, electronic mail, radio, and publications. An Internet-based MS hay directory was initiated by Extension as a result of industry requests. A statewide program was offered over the Extension interactive videoconferencing system in MS in August 2006



addressing drought coping strategies for beef producers. Attendance (n=491) at this program was 241% greater than the highest attendance at similar programs delivered via the same media over the previous two years, and the number of sites participating (n=50) was nearly double the previous record number of sites participating (n=27) in this type of program. A 44-page Beef Producer Guide to Coping with Drought Conditions publication was developed by a team of Extension specialists and veterinarians in the span of 5 d. While the MS group took the lead in authoring the beef cattle publication for both MS and LA, the LA group produced a reciprocal dairy publication. Livestock Extension leadership in LA developed a series of disaster-related publications and combined MS contributions into comprehensive disaster guides for the two states. Producer responses to Extension programs focused on disaster issues illustrated the increased demand for producer education in the event of extended disaster conditions. Cooperative Extension programming efforts across state lines and livestock species was effective in rapidly responding to a crisis situation with limited personnel resources.

**Key Words:** drought, extension, disaster response

**19 Extension disaster preparedness: Lessons from hurricanes Katrina and Rita.** J. Rowntree<sup>\*1</sup>, J. Parish<sup>2</sup>, C. Navarre<sup>1</sup>, M. Keene<sup>2</sup>, M. Howell<sup>2</sup>, L. Newman<sup>2</sup>, and E. Collum<sup>2</sup>, <sup>1</sup>Louisiana State University Agricultural Center, Baton Rouge, <sup>2</sup>Mississippi State University Extension Service, Mississippi State.

Disaster preparedness is now a major programming effort in Louisiana (LA) and Mississippi (MS) livestock Extension programs due in large part to the devastating effects of Hurricanes Katrina and Rita on the livestock industries in both states in 2005. The vulnerability of LA and MS to hurricanes makes hurricane and other disaster preparedness essential. The objective of this synopsis is to outline Extension involvement in disaster preparedness for LA and MS livestock producer education programs. Extension action items included receiving appropriate and relevant incident management training, developing emergency response plans, and producing and disseminating disaster preparedness and response educational materials. With respect to LA, LSU AgCenter personnel joined forces with the LA Department of Agriculture and Forestry and the LA State Animal Response Team to develop state-wide agricultural emergency plans. The MS Animal Response Team also involved Extension personnel working cooperatively with the MS Department of Agriculture and Commerce and additional collaborators on livestock disaster management plans. Extension professionals assisted county groups in developing local emergency plans and acquiring training in disaster management. Training in National Incident Management Systems and Incident Command Systems 100 and 200 was offered to Extension employees as in-service training. The daylong "Getting Back on Track" beef cattle producer education program in Hattiesburg, MS emphasized both disaster recovery and preparedness recommendations. The LSU AgCenter, in cooperation with MS State University, developed a series of disaster preparedness and recovery fact sheets for livestock producers. These publications were placed on Extension websites in both states and also printed and stockpiled for distribution during widespread power outages where access to Internet-based information is limited. Current challenges faced by Gulf Coast cattle producers include ranch infrastructure repair and replacement, pasture recovery and development, replacement cattle acclimation to new areas, and salinity level concerns in former fresh water marshes.

**Key Words:** livestock, extension, disaster preparedness

**20 Relative value of soybean hulls (SBH) and dry corn gluten feed (CGF) from two sources on performance and economic return from stocker cattle fed hay-based diets.** M. H. Poore<sup>\*</sup>, North Carolina State University, Raleigh.

A study was conducted over 2 years to compare the value of 2 common byproducts (BP), pelleted SBH and CGF, and to compare CGF from 2 sources. The CGF was either in the loose form from Corn Products in Winston Salem, NC (LCGF), or in the pelleted form from A.E. Staley in Loudon, TN (PCGF). Hay, SBH, LCGF, and PCGF contained 12.7, 11.4, 24.6, and 23.9% CP, and 66.8, 66.3, 32.3, and 31.7% NDF, in yr 1; and 13.9, 12.1, 24.7, and 18.5% CP, and 62.2, 65.4, 38.9, and 32.3% NDF in yr 2, respectively. Backgrounded Angus cross steers (initially 253 kg) were assigned to 1 of 8 pens, with 5 steers per pen. Each yr 2 pens received one of 4 treatments (tmt); 1) free-choice hay (HAY), 2) hay and 2.7 kg/hd daily SBH, 3) hay and 2.7 kg/head daily LCGF, or 4) hay and 2.7 kg/head daily PCGF. The tmt were compared using pre-planned contrasts: HAY vs. BP, SBH vs. CGF, and LCGF vs. PCGF. Steers readily accepted each BP and were at the target feeding level within 5 days. There were no yr by tmt interactions, so data are presented across years. Steers fed BP gained faster than HAY steers ( $P < 0.01$ ), but there were no differences in ADG between the BP (0.65, 0.96, 0.97, and 1.04 kg/d, for HAY, SBH, LCGF, and PCGF, respectively). HAY steers consumed more ( $P < 0.05$ ) hay DM, but less ( $P < 0.05$ ) total DM than supplemented steers, while there were no differences between BP for either measure (6.77, 5.73, 5.31, and 5.56 kg/d; and 6.77, 8.03, 7.68, 7.93 kg/d for HAY, SBH, LCGF, and PCGF, respectively). Gain:Feed was improved ( $P < 0.01$ ) when BP were fed, but there was no difference between BP (0.096, 0.120, 0.127, and 0.131 for HAY, SBH, LCGF, and PCGF, respectively). For economic evaluation calves had an initial value of \$1.23/0.455 kg based at 227 kg, with a \$0.027/45.5 kg slide as wt increased. Feeds were valued at 80, 100, 120, and 120 \$/909 kg for hay, LCGF, SBH, and PCGF, respectively. Return over feed cost was improved ( $P < 0.05$ ) by feeding BP, and tended ( $P = 0.12$ ) to be higher for CGF than for SBH (36.26, 53.92, 64.69, and 63.72 \$/steer, for HAY, SBH, LCGF, and PCGF, respectively).

**Key Words:** byproducts, cattle, corn gluten feed

**21 Performance of feeder steers fed differing levels of soybean hulls and corn on a hay-based ration.** A. E. Fisher<sup>1</sup>, C. J. Richards<sup>2</sup>, W. W. Gill<sup>\*1</sup>, and C. D. Lane, Jr.<sup>1</sup>, <sup>1</sup>University of Tennessee, Knoxville, <sup>2</sup>Oklahoma State University, Stillwater.

The objective of this study was to evaluate the effects of supplements containing different combinations of high-energy fibrous feedstuffs and concentrate on growth performance and feed efficiency of beef steer calves. In the first year of two-year study, 72 weaned beef steers were randomly allotted to one of six treatments based on weight and breed. All steers were supplied with hay alone (1 treatment) or a combination of hay and supplement (5 treatments) daily. For supplemented treatments, hay supplied approximately 60% of daily energy with the additional energy (40%) coming from supplements consisting of 100, 75, 50, 25 or 0% of supplemental energy from soybean hulls and the remaining supplemental energy from cracked corn. The amount of hay provided to calves was initially equal to 1.5% initial body weight (except for control treatment, which was fed at 2.25% initial body weight). The total supplementation was approximately 0.75% initial body weight. Steers were weighed on consecutive days at the initiation and termination of the experiment.

A single day weight of calves was taken at day 28 of the experiment. There were 24 pens with 3 steers per pen (2 Angus and 1 Gelbvieh). The experimental design was a randomized complete block with 6 treatments and 4 replications where the pen is the experimental unit. All data were analyzed using the MIXED procedure of SAS and differences were determined at  $P < 0.05$ . The presence of soybean hulls in the supplement increased performance over 100% cracked corn; all supplements increased performance over hay alone.

**Table 1. Initial weights, final weights and ADG of steers.**

Treatment	Initial Weight, kg	Final Weight, kg	P1 ADG, kg/d	P2 ADG, kg/d	Total ADG, kg/d
Hay	291 <sup>A</sup>	311 <sup>B</sup>	0.68 <sup>C</sup>	0.03 <sup>C</sup>	0.35 <sup>C</sup>
100% Soybean hulls	289 <sup>A</sup>	333 <sup>A</sup>	1.14 <sup>A</sup>	0.43 <sup>A</sup>	0.78 <sup>A</sup>
75% Soybean hulls	289 <sup>A</sup>	332 <sup>A</sup>	1.08 <sup>A</sup>	0.44 <sup>A</sup>	0.75 <sup>A</sup>
50% Soybean hulls	288 <sup>A</sup>	329 <sup>A</sup>	1.00 <sup>AB</sup>	0.44 <sup>A</sup>	0.72 <sup>A</sup>
25% Soybean hulls	288 <sup>A</sup>	331 <sup>A</sup>	1.04 <sup>AB</sup>	0.49 <sup>A</sup>	0.77 <sup>A</sup>
100% Corn	288 <sup>A</sup>	318 <sup>AB</sup>	0.83 <sup>BC</sup>	0.22 <sup>B</sup>	0.53 <sup>B</sup>

<sup>A,B,C</sup>Variables within columns not sharing superscripts are significantly different at  $P < 0.05$ .

**Key Words:** beef cattle, supplementation strategies, soybean hulls

**22 Impact of the initiation of the Florida Beef Quality Assurance program.** M. Hersom\*, T. Thrift, and M. Irsik, *University of Florida, Gainesville*.

The Florida Beef Quality Producer (FBQP) program is a cooperative program that was developed by the University of Florida beef cattle extension group, the Florida Department of Agriculture, and the Florida Cattlemen's Association. The objective of the program was to educate and update cattle producers on the principles and practices associated with Beef Quality Assurance (BQA). Prior to the initiation of the FBQP, Florida cattle producers did not have direct delivery or access to BQA material. The program was initiated in the fall of 2005 and continued into the spring of 2006. Eight regional meetings were held throughout the state of Florida. A total of 330 individuals were certified. Participants included beef cattle producers, allied industry, state department of agriculture, and county extension personnel. As part of the registration process, participants were asked for the number of cows in their herd, 138,080 total cows were reported. Producers that attended the meeting received a 140 page manual that outlined the components of a BQA plan and a DVD that targeted injection site management. The FBQP program consisted of a 6 h initial classroom education setting. A 24-question true/false pre-program evaluation was completed by all of the participants to measure their initial knowledge base. The same 24-question true/false post-program evaluation was also completed by all the participants. In addition to measuring knowledge gain, several questions were asked with subjective responses about the impact of the program on the participant's understanding of how to produce safer beef and knowledge about reducing carcass outliers and defects through management (mean=8.3 and 8.4; respectively; 1=no impact; 10=major impact). Additional statewide meetings to expand participation in the FBQP program are planned. Likewise, advanced training in record keeping, record auditing, and cattle process auditing will be developed as additional education opportunities in the FBQP program.

**Key Words:** cattle, quality assurance, extension

**23 Effects of pen sanitation and plasma protein supplementation on performance of weanling pigs.** A. F. Harper\* and M. J. Estienne, *Virginia Polytechnic Institute and State University, Blacksburg*.

The objective was to demonstrate the impact of pen sanitation within all-in-all-out nursery rooms on pig performance. Crossbred weanling pigs ( $n = 128$ ; initial BW  $7.51 \text{ kg} \pm 0.02$ ) were blocked by weight, sex and litter and assigned in pens of 4 to the following treatments: 1) a dirty pen and a phase I diet with 6% spray-dried plasma protein (SDPP); 2) a clean pen and a phase I diet with 6% SDPP; 3) a dirty pen and a phase I diet with no SDPP; 4) a clean pen and a phase I diet with no SDPP. There were 8 replicate pens for each treatment. Feed and water were available ad libitum. Dirty pens were prepared by applying manure to pen surfaces before weaning. Clean pens were prepared by pressure washing and applying disinfectant. The phase I diets were fed during the initial 8 d post-weaning following by feeding common phase II and phase III diets to all treatment groups for the next 8 and 16 d, respectively. A female pig was removed from each pen on d 8 for use in a related study. During phase I dietary addition of 6% SDPP resulted in increased ADG ( $176 \text{ vs } 139 \pm 7 \text{ g/d}$ ,  $P < 0.001$ ), ADFI ( $270 \text{ vs } 228 \pm 7 \text{ g/d}$ ,  $P < 0.006$ ) and tended to improve G:F ( $0.65 \text{ vs } 0.60 \pm 0.02$ ,  $P = 0.091$ ). At the end of the 32 d trial the growth advantage for pigs supplemented with SDPP during phase I compared to those not given SDPP was no longer detectable (BW  $21.04 \text{ vs } 21.53 \pm 0.33 \text{ kg}$ ,  $P = 0.30$ ). Effects of pen sanitation were not detected during phases I and II ( $P > 0.21$ ) but ADG was greater for pigs placed in clean pens during phase II and III combined ( $533 \text{ vs } 510 \pm 12 \text{ g/d}$ ,  $P < 0.04$ ) and G:F favored pigs placed in clean pens for the overall trial ( $0.76 \text{ vs } 0.73 \pm 0.01$ ,  $P < 0.07$ ). Diet by pen sanitation interactions were not significant during the first two diet phases ( $P > 0.24$ ) and showed no discernable pattern overall. The data illustrate that enhanced growth associated with addition of SDPP to phase I pig diets may not be maintained throughout the nursery period. Pen cleaning and disinfection for all-in-all-out management of pig nurseries is important, but growth responses may not be apparent until later stages in the nursery period.

**Key Words:** pigs, sanitation, performance

**24 Effects of exit speed velocity on feedlot performance and carcass traits of Angus, Brangus, and Braford steers.** J. E. Rossi\*, J. F. Baker, P. T. Cannon, and B. G. Mullinix, Jr., *University of Georgia, Tifton*.

Two hundred forty one steers originating from four calf crops were used to evaluate the effects of exit speed velocity (EV) on feedlot performance and carcass traits. Calves consisted of Angus (AN;  $n=71$ ), Brangus (BN;  $n=109$ ), and Braford (BO;  $n=61$ ) steers. To obtain EV, calves were first weighed on a platform scale and released to a squeeze chute. The calf was then released from the squeeze chute and time to travel 1.83 m was determined by a laser timing device. Steers were evaluated for EV at four, seven, and twelve mo of age. Steers were shipped to a commercial feedlot at 12 mo of age for finishing. Carcass data was collected 48 post-harvest. Exit velocity was similar among breeds at four ( $p = 0.32$ ) and seven mo of age. At twelve mo of age, EV was greater ( $P < 0.03$ ) for BN ( $2.18 \text{ m/s}$ ) than for AN ( $1.82 \text{ m/s}$ ) or Braford ( $1.71 \text{ m/s}$ ) steers. Daily gain during the finishing period was similar ( $P = 0.40$ ) among breeds. In addition, yield grade assigned by the USDA grader was similar ( $P = 0.23$ ) among breeds. Marbling score was greater ( $P < 0.01$ ) for AN than for BN and BO steers. The correlation coefficient ( $r$ ) between weight at feedlot entry and EV was

+0.05 ( $P > 0.45$ ), -0.14 ( $P < 0.04$ ), and -0.22 ( $P < 0.01$ ), at four, seven, and twelve mo of age; respectively. The ( $r$ ) between EV and daily gain during the finishing period was -0.24 ( $P < 0.01$ ), -0.23 ( $P < 0.05$ ) and +0.21 ( $P < 0.01$ ), at four, seven, and twelve mo of age; respectively. The  $r$  between EV and both marbling score and yield grade was not significant ( $P > 0.10$ ) at any age. Performance during the finishing period was similar among breeds. Few differences were noted in carcass traits among breeds, with the exception of marbling score being greater for AN steers than BN or BO steers. Exit speed velocity was correlated with feedlot daily gains but not carcass traits.

**Key Words:** steers, temperament, performance

**25 Effects of monensin fed to pregnant beef cows wintered on hay.** J. T. Johns<sup>\*1</sup>, W. R. Burris<sup>1</sup>, K. D. Bullock<sup>1</sup>, and E. Thomas<sup>2</sup>, <sup>1</sup>University of Kentucky, Lexington, <sup>2</sup>Elanco Animal Health, Indianapolis, IN.

Two trials were conducted to determine the effects of feeding Monensin (M) to pregnant beef cows consuming hay during the winter. At both locations, cows were allocated to the M treatment or a non-medicated control (C) group based on cow age, previous calving date, weight and body condition score (BCS, 1 through 9). At location 1, square bales of grass hay were used and C cows were provided ad libitum intake of hay and .45 kg/d of the supplement without Monensin. M cows received 85% of the amount of hay C cows consumed the previous day and .45 kg/d of supplement providing 150 mg of Monensin. There was no effect of treatment ( $P > .1$ ) on cow measurements, which included final weight, final BCS, weight change and BCS change. There was also no effect of treatment ( $P > .1$ ) on calf birth weight and calf adjusted weaning weight. Using feed purchase prices, feeding monensin to pregnant cows resulted in a 13% saving in winter feed costs with no detrimental effect on production. Cows at location 2 received rolls of hay making adjustment of consumption for the M group not possible as would be the case for many producers. In addition to hay, C and M cows at location 2 also received .45 kg daily of the non-medicated and medicated supplements respectively. There was no effect of treatment ( $P > .1$ ) on cow final weight or cow final body condition score as well as calf birthweight and calf adjusted weaning weight. Use of monensin prevented the loss of cow winter BCS ( $P < .05$ ) and cow weight ( $P < .01$ ). Monensin fed cows maintained improved BCS and body weight while consuming the same amount of hay during the winter as C cows.

**Key Words:** monensin, beef cows, hay

## Graduate Student Competition

**27 Sensory traits of beef patties treated with rosemary oleoresin and oregano essential oil to improve safety.** M Tittor<sup>\*</sup>, J. C. Brooks, M. T. Brashears, M. F Miller, and M. M. Brashears, Texas Tech University, Lubbock.

Natural antimicrobial compounds are attractive food safety interventions. However, the effect of these ingredients on palatability traits must be investigated prior to their use. This study investigated the effect of known antimicrobials, rosemary oleoresin and oregano essential oil, on the sensory characteristics of ground beef patties. Three lean levels of ground beef (70, 80, 90% lean) were treated with rosemary oleoresin (0.2% v/w), oregano essential oil (0.03% v/w) or nothing (control). The treated beef was portioned into patties and packaged in traditional retail packaging (polyvinylchloride film over-wrap),

**26 Participant evaluation of the Tennessee Master Beef Producer Program.** J. B. Neel<sup>\*</sup>, A. E. Fisher, C. D. Lane, Jr., W. W. Gill, and F. D. Kirkpatrick, University of Tennessee, Knoxville.

The Tennessee Master Beef Producer program (MBP) is a multi-discipline Extension educational program designed for cow-calf producers. It is funded with user fees and grants from the Tennessee Department of Agriculture's Agricultural Enhancement Program. Extension specialists developed the curriculum and trained Extension agents who delivered the MBP either in county or multi-county sessions. Thirteen topics were taught in ten 3-hour sessions. These included: Managing a Beef Operation, Marketing, Genetics, Carcass Quality, Feeding and Nutrition, Forage Production, Reproduction, Herd Health, Handling Facilities, Behavior, Environmental Concerns, Food Safety, and Record Keeping. All data were analyzed using the FREQ procedure of SAS. Twelve hundred and eight producers from 64 counties participated in 54 sessions since 2004. Producers were asked to complete an evaluation of the MBP. They were asked if they plan on making any changes in their operation as result of the MBP. Of the 300 that responded, 87.42% indicated they would make changes in managing and planning, 81.29% in forage production, 74.52% in health, 70.65% in feeding and 68.71% in genetics with their herds. Sixty-five percent of the participants reported that the economic impact would range from \$1,000 to \$5,000 if they made changes to their operation as result of what they learned. Eighty-eight (87.68%) reported that the MBP was a good comprehensive program, 99.50% would recommend MBP to other producers, 20.83% asked for more hands-on and 13.33% wanted more time for interaction with other producers and instructors. Ninety-seven percent (96.94%) indicated they would be willing to pay a user fee for future programs and 56.64% would pay \$100.00. Health (26.39%), genetics (22.22%), and reproduction (19.72%) received the greatest response as topics to be taught in a graduate level MBP. The Tennessee Master Beef Producer program is now in the fourth year and a graduate level program is being planned.

**Key Words:** extension educational programs, Master Beef Producer, cow-calf producers

modified atmosphere packaging (MAP, 80% oxygen, 20% carbon dioxide) or vacuum packaging. Samples were collected for consumer sensory analysis on d 0, 2 and 4 of retail display at 4°C, and after 30 and 60 d of frozen storage at -20°C. Attributes evaluated were overall liking and flavor liking (1= extremely dislike, 8= extremely like); and characteristic ground beef flavor (1= extremely non-characteristic, 8= extremely characteristic). For all package types, consumers ranked oregano treated patties lower for overall liking, flavor liking and characteristic beef flavor ( $P < 0.05$ ). Packaging type had no effect on flavor liking scores over display or storage time, but vacuum packaging decreased variation in quality attributes over time. Patties treated with oregano oil and packaged in MAP had significantly lower overall liking scores than rosemary oleoresin or control treated patties. Rosemary oleoresin addition produced flavor liking, overall liking and

characteristic ground beef flavor scores similar to controls. Although research indicated the oregano oil used in this study is an effective antimicrobial, more work is needed to manage the flavor attributes of beef patties treated with the essential oil.

**Key Words:** beef, oregano, sensory

**28 Development of an automatic, indwelling rectal temperature probe for cattle research.** R. R. Reuter<sup>\*1,2</sup>, J. A. Carroll<sup>2</sup>, J. W. Dailey<sup>2</sup>, C. C. Chase, Jr.<sup>3</sup>, S. W. Coleman<sup>3</sup>, D. G. Riley<sup>3</sup>, D. E. Spiers<sup>4</sup>, R. L. Weaver<sup>4</sup>, and M. L. Galyean<sup>1</sup>, <sup>1</sup>Texas Tech University, Lubbock, <sup>2</sup>USDA-ARS, Livestock Issues Research Unit, Lubbock, TX, <sup>3</sup>USDA-ARS, SubTropical Agricultural Research Station, Brooksville, FL, <sup>4</sup>University of Missouri, Columbia.

A device to continuously monitor rectal temperature of beef cattle in research settings was developed with the objective of obtaining frequent measurements on several animals simultaneously, while minimizing labor and handling. The device consists of a modified polyvinylchloride pipe coupling that is attached to the animal's tail that supports a plastic tube that contains a temperature-sensitive probe. The probe is attached to an electronic, programmable data logger that can record temperature at any desired interval with minimal disturbance to the animal. Rectal temperature data were collected with the device from 9 Angus and 9 Romosinuano steers in environmentally controlled chambers (19.7°C) at 1-min intervals from -2 h to 8 h. At time 0, all steers received an i.v. injection of lipopolysaccharide (LPS; 2.5 µg/Kg BW). Skin temperature, ruminal temperature, respiration rate, perspiration rate, and serum concentrations of cortisol (CS), pro-inflammatory cytokines (tumor necrosis factor-alpha and interleukin-6), and acute-phase proteins were also measured at 30- to 60-min intervals over the same period as rectal temperature. The increase in rectal temperature following the LPS challenge was greater ( $P = 0.10$ ) for Romosinuano than for Angus steers, indicating that the device could detect breed differences in rectal temperature response. Rectal temperature was a significant covariate for tumor necrosis factor-alpha ( $P = 0.02$ ) and interleukin-6 ( $P = 0.003$ ) in a repeated measures ANOVA model that included breed, time, and their interaction, indicating that rectal temperature measured with the device was related to these pro-inflammatory cytokines. The reusable device can be constructed for approximately \$150 US per unit, and could be adapted to a wide range of uses in cattle health, physiology, and management research.

**Key Words:** body temperature, cattle immunity, monitoring

**29 Effects of body condition, somatotropin, and prolactin promoter gene polymorphisms on concentrations of prolactin, follicle size, and calving rates of postpartum Brahman-influenced cows.** R. Flores<sup>\*1</sup>, M. L. Looper<sup>2</sup>, S. T. Reiter<sup>1</sup>, and C. F. Rosenkrans, Jr.<sup>1</sup>, <sup>1</sup>University of Arkansas, Fayetteville, <sup>2</sup>USDA-ARS, Dale Bumpers Small Farms Research Center, Booneville, AR.

Objectives were to evaluate effects of body condition (BC), bovine somatotropin (bST), and prolactin promoter genotypes on concentrations of prolactin, follicle size, and calving rates of Brahman-influenced beef cows. Cows ( $n = 99$ ) were managed to achieve low (BCS =  $4.3 \pm 0.1$ ) or moderate (BCS =  $6.1 \pm 0.1$ ) BC at initiation of the breeding

season and treated with bST every 2 wk for 6 wk beginning at 35 d before breeding (d 0) or no bST (control). Blood was collected on d -35, -28, -21, -7, and 0 to quantify concentrations of prolactin and to obtain genomic DNA. All cows received a controlled internal drug releasing (CIDR) device 7 d before breeding. On d 0, CIDR was removed, and cows received prostaglandin  $F_{2\alpha}$  (PGF<sub>2α</sub>). Ultrasound was performed on d 1 after CIDR-PGF<sub>2α</sub> to determine diameter of the largest follicle. Genotyping was performed on 92 cows by PCR-RFLP. Frequencies ( $P < 0.001$ ) for C and T alleles and CC, CT, TT genotypes were 0.42, 0.58, 0.09, 0.66, and 0.25, respectively. Across all sample dates, moderate BC-bST-treated cows of the CC and CT genotypes had greater ( $P < 0.05$ ) concentrations of prolactin than low BC-bST-treated cows of the CC and CT genotypes. Diameter of the largest follicle following CIDR-PGF<sub>2α</sub> was greater ( $P = 0.04$ ) for bST-treated cows of the CC genotype than control cows of the CC genotype ( $19.5 \pm 2.4$  mm vs.  $11.7 \pm 2.8$  mm). Moderate BC cows tended ( $P = 0.12$ ) to have a higher calving rate (56%) compared with low BC cows (44%). Calves born from cows treated with bST had decreased ( $P = 0.02$ ) mean Julian birthdays ( $71.1 \pm 2.8$  d) than calves born from control cows ( $81.2 \pm 2.8$  d). Associations of polymorphisms within the prolactin promoter gene with concentrations of prolactin, diameter of the largest follicle, and calving rate appear to be related with the level of BC and (or) bST treatment.

**Key Words:** Brahman, prolactin, SNP

**30 Identification of single nucleotide polymorphisms within the promoter region of the bovine heat shock protein 70 gene and associations with pregnancy.** A. Banks<sup>\*1</sup>, M. Looper<sup>2</sup>, S. Reiter<sup>1</sup>, L. Starkey<sup>1</sup>, R. Flores<sup>1</sup>, D. Hallford<sup>3</sup>, and C. Rosenkrans, Jr.<sup>1</sup>, <sup>1</sup>University of Arkansas, Fayetteville, <sup>2</sup>USDA/ARS, Booneville, AR, <sup>3</sup>New Mexico State University, Las Cruces.

Heat shock proteins (HSPs) are induced by various stressors. Our objectives were: 1) determine the genetic diversity in a promoter segment of the bovine HSP-70 gene, and 2) determine if the identified single nucleotide polymorphisms (SNPs) were related to pregnancy rates. Genomic DNA was collected from 107 *Bos taurus*/*Bos indicus* crossbred cows. Specific primers (HSP-Pro749F: GCCAGGAAAC-CAGAGACAGA; HSP-Pro1268R: CCTACGCAGGAGTAGGTGGT) were used for PCR amplification of a 539 base segment of the bovine HSP-70 promoter (GenBank accession number M98823). The PCR product was sequenced in both directions. Nine SNPs were identified. The SNPs were located at base positions 1045 ( $n = 7$ , 6.5%), 1069 ( $n = 6$ , 5.6%), 1096 ( $n = 9$ , 8.4%), 1117 ( $n = 9$ , 8.4%), 1125 ( $n = 42$ , 39.3%), 1128 ( $n = 42$ , 39.3%), 1134 ( $n = 5$ , 4.7%), 1154 ( $n = 10$ , 9.4%) and 1204 ( $n = 35$ , 32.7%). A deletion at base position 895 was present in 18 animals (16.8%). Pregnancy rate was higher ( $P < 0.01$ ) for cows that were homozygous A at the 1125 site. In addition, cows that did not have the deletion at base 895 had higher ( $P < 0.01$ ) pregnancy rates than the cows exhibiting the deletion (81 vs 18%). Cows classified as moderate body condition score (BCS) and AA at the 1125 site had higher ( $P < 0.1$ ) pregnancy rates than cows with thin BCS and AA at the 1125 site; whereas, BCS did not alter pregnancy rates for the cows that were CC at the 1125 site. Concentrations of serum metabolites at 35 d prior to the breeding season were used as indicators of genotype by BCS interactions. Growth hormone concentrations were greater ( $P < 0.05$ ) for moderate BCS and CC cows than moderate BCS and AA cows ( $8.6$  vs  $4.7$  ng/mL). A similar interaction occurred for IGF-1 and lactate dehydrogenase activity. Cows without the deletion at 895 tended ( $P < 0.13$ ) to have greater IGF-1 serum concentrations at 35

d prior to the breeding season than cows with the deletion (84 vs 70 ng/mL). Our results indicate that the promoter region of the bovine HSP-70 gene is polymorphic and may be useful in selecting cows with a propensity for higher calving rates.

**Key Words:** HSP-70, cattle, genomics

**31 Effects of PGF2 $\alpha$  and 15-Keto PGF2 $\alpha$  on leptin and PGF receptor gene expression in adipose tissue at estrus and the mid-luteal stage of the estrous cycle.** E. Gonzales\*<sup>1</sup>, C. O’Gorman<sup>1</sup>, K. Collard<sup>1</sup>, Y. Matsumoto<sup>1</sup>, D. Keisler<sup>3</sup>, R. Stanko<sup>1,2</sup>, and M. Garcia<sup>1</sup>, <sup>1</sup>Texas A&M University-Kingsville, <sup>2</sup>Texas A&M University Agricultural Research Station, Beeville, TX, <sup>3</sup>University of Missouri, Columbia.

Leptin a potent satiety hormone primarily synthesized and secreted by adipocytes has been previously reported to differ relative to stages of the estrous cycle in heifers. From estrus to the mid-luteal stage of the estrous cycle, leptin gene expression remains constant; however, during the late-luteal stage leptin gene expression decreases. It is during this stage that PGF2 $\alpha$  and its primary metabolite 15-keto-PGF2 $\alpha$  are elevated in bovine serum. Therefore, the effect of PGF2 $\alpha$  and 15-keto-PGF2 $\alpha$  on leptin and prostaglandin receptor (PGFr) gene expression in estrogen and progesterone primed adipocytes in heifers was determined. Subcutaneous adipose tissue (5g) was collected lateral to the tail head region from mature crossbred heifers at estrus (d 0; n=9) and the mid-luteal stage (d 10; n=9) of the estrous cycle. Two g of adipose tissue was frozen in liquid N<sub>2</sub> and the remaining tissue was processed for adipocyte isolation and culture. Adipocytes were cultured with or without PGF2 $\alpha$  or 15-keto-PGF2 $\alpha$  (10-11, 10-10, 10-9, 10-8 and 0 M; n=3 wells/dose/heifer) and incubated at 37°C for 18h. Leptin and PGFr mRNA was quantitated using relative real-time PCR. Values obtained from culture treatments were expressed as a percentage of 0 M (0M=100%). Effect of treatment on leptin and PGFr gene expression was determined using the MIXED procedure of SAS. As has been previously reported leptin did not differ in adipose tissue at estrus or the mid-luteal stage of the estrous cycle. Fifteen-keto-PGF2 $\alpha$  did not affect adipocyte leptin nor PGFr gene expression. However, physiological concentrations of PGF2 $\alpha$  (10-8 M) tended (P=0.1) to decrease leptin gene expression in adipocytes obtained at estrus (80.5%  $\pm$  12.7% vs. 0 M, respectively). Prostaglandin F2 $\alpha$  receptor gene expression tended (P=0.1) to increase in PGF2 $\alpha$  treated adipocytes obtained at estrus; however, mid-luteal adipocytes did not exhibit a similar response to PGF2 $\alpha$  treatment. Hence, changes in leptin during the late-luteal stage of the estrous cycle may not be attributed to PGF2 $\alpha$  or 15-keto-PGF2 $\alpha$  alone.

**Key Words:** Prostaglandin F2 $\alpha$ , heifer, leptin

**32 Fetal exposure to maternal stress influences leptin receptor gene expression during development and age at puberty in gilts.** C. W. O’Gorman\*<sup>1</sup>, E. Gonzales<sup>1</sup>, M. D. Eaton<sup>1</sup>, K. A. Collard<sup>1</sup>, M. Reyna<sup>1</sup>, J. C. Laurenz<sup>1</sup>, R. L. Stanko<sup>2,1</sup>, D. H. Keisler<sup>3</sup>, J. A. Carroll<sup>4</sup>, and M. R. Garcia<sup>1</sup>, <sup>1</sup>Texas A&M University-Kingsville, <sup>2</sup>Texas A&M University Agricultural Research Station, Beeville, <sup>3</sup>University of Missouri, Columbia, <sup>4</sup>USDA-ARS Lubbock, Lubbock, TX.

Various factors influence age at puberty such as stress and leptin. Stress delays age at puberty and absence of leptin or lack of central perception

of leptin leads to perpetual sexual immaturity. The environment in which a fetus develops is believed to play a role in the development of various physiological systems. Therefore in utero exposure to various factors in response to external stimuli such as maternal stress could have adverse effects on postnatal growth and possibly reproductive development. Potential mechanisms involved may include the access of leptin into the brain. Hence, the effect of maternal stress on the age at puberty and Ob-Ra production in the choroid plexus of female progeny was determined. Gestating crossbred sows of similar age and weight were randomly allocated to one of two treatment groups: Control (C) or Stressed (S). S sows were subjected to daily restraint for 5 min during wk 12-16 of gestation. Female offspring were checked twice daily (30 min) for estrus beginning at 122 d of age. On the d of pubertal estrus, blood samples were collected and gilts were euthanized. The choroid plexus was harvested from the lateral, third, and fourth ventricles and analyzed for Ob-Ra expression. Age at first estrus was delayed (P<0.05) in gilts from S sows compared to gilts from C sows (172 $\pm$ 6d vs. 158 $\pm$ 2d, respectively). Moreover, Ob-Ra mRNA in the choroid plexus was 3.6 fold greater (P<0.001) in pubertal gilts from C sows compared to gilts from S sows. Based on these results, a second experiment was conducted to determine if the difference in Ob-Ra occurred prior to puberty. Hence, gilts from C or S-treated sows were euthanized at 2,3, and 4 months of age for Ob-Ra analysis in the choroid plexus. Beginning at 4 mo of age differences in Ob-Ra gene expression were detected, tending (P=0.1) to be higher in gilts from C sows than in gilts from S sows. Collectively, these results suggest Ob-Ra production in the choroid plexus may play a role in developmental processes that may be linked to reproduction.

**Key Words:** gilts, puberty, leptin receptor

**33 Temporal pattern of the stress hormone and cytokine response in pigs following a lipopolysaccharide (LPS) challenge.** P. N. Williams\*<sup>1</sup>, J. A. Carroll<sup>2</sup>, T. H. Welsh, Jr.<sup>3</sup>, and J. C. Laurenz<sup>1</sup>, <sup>1</sup>Texas A&M University-Kingsville, <sup>2</sup>USDA-ARS, Livestock Issues Research Unit, Lubbock, TX, <sup>3</sup>Texas A&M University, College Station.

This study assessed the pattern of immune and stress response following a LPS challenge. Crossbred pigs (n=28 pigs, 2 males and 2 females from 7 litters) were obtained at weaning (21 to 28 d of age). Pigs were transferred to a climate controlled facility, placed into individual pens and allowed ad libitum access to feed and water. Pigs were allowed to acclimatize for two weeks before LPS challenge. One day prior to challenge, pigs were weighed and non-surgically fitted with jugular catheters. On the following day pigs were infused i.v. with LPS (25  $\mu$ g/Kg BW) and blood samples collected every 30 min for 1 hour prior to and 6 h following LPS challenge. Serum was analyzed for cortisol, norepinephrine (NE), epinephrine (E), tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), interleukin-6 (IL-6), and IL-1 $\beta$ . There was a time-dependent increase (P<0.01) in concentrations of the proinflammatory cytokines following LPS, with peak values occurring at 1, 2.5, and 3 hours post-LPS for TNF- $\alpha$ , IL-6, and IL-1 $\beta$  (168 $\pm$ 13 ng/mL, 2859 $\pm$ 417 pg/mL and 686 $\pm$ 114 pg/mL, respectively). Consistent with previous studies, cortisol increased (P<0.01) in a time-dependent manner following LPS with peak values at 3.5 h post-infusion (143 $\pm$ 13 ng/mL). Concentrations of NE and E also increased (P<0.01) in a time-dependent manner following LPS with peak values at 15 and 30 min post-LPS (3017 $\pm$ 624 and 801 $\pm$ 368 pg/mL for NE and E, respectively). There was a positive correlation between peak TNF- $\alpha$  and cortisol concentration (r=0.39; P<0.05). However, positive correlations between IL-1 $\beta$ , IL-6 and

cortisol were found only in females ( $r=0.54$  and  $0.83$ , respectively;  $P<0.05$ ). No correlations ( $P>0.30$ ) were found between the catecholamines and IL-6. There was a tendency for NE to be negatively correlated with TNF- $\alpha$  concentration ( $r=-0.30$ ;  $P=0.13$ ) and E concentration to be positively correlated with IL-1 $\beta$  in males ( $r=0.51$ ;  $P<0.08$ ). This study is the first to report the temporal pattern of catecholamines following LPS infusion in pigs. Results suggest that both cortisol and the catecholamines modulate the production of inflammatory cytokines during the acute phase response.

**Key Words:** LPS, cytokines

**34 Effect of temperament on passive immunity, cortisol concentrations, and early growth in the calf.** N. C. Burdick\*<sup>1</sup>, R. D. Randel<sup>2</sup>, J. P. Banta<sup>2</sup>, D. Neuendorff<sup>2</sup>, J. C. White<sup>2</sup>, T. H. Welsh, Jr.<sup>3</sup>, R. C. Vann<sup>4</sup>, and J. C. Laurenz<sup>1</sup>, <sup>1</sup>Texas A&M University-Kingsville, <sup>2</sup>Texas A&M University Agricultural Research and Extension Center, Overton, TX, <sup>3</sup>Texas A&M University, College Station, <sup>4</sup>Mississippi State University, Raymond.

The effect of temperament on passive immunity, stress hormones, and early growth in the calf was assessed. Blood samples were collected and serum and plasma isolated from Brahman calves ( $n = 116$ ) on d 0, 1, 2, 7, 14, and between d 21-24 after birth. Serum concentrations of IgA, IgM, IgG (Igs) were determined by ELISA specific for bovine immunoglobulins, and cortisol (C) was determined by RIA. Body weight (BW) was measured weekly from birth through d 24 for calculation of average daily gain (ADG), and exit velocity (EV) was determined as a measure of temperament. Calves were ranked based on their EV (EV Rank) with calves 1 SD slower than the mean ranked 1, calves 1 SD faster than the mean ranked 3 and remaining calves ranked 2. As expected, calf BW increased over time ( $P<0.01$ ) and was affected by gender with female calves having lower ( $P<0.01$ ) BW than male calves at all time points. Serum Ig concentration increased from birth and reached maximum concentrations on d 1 for IgA ( $0.93 \pm 0.01$  mg/mL) and IgM ( $1.03 \pm 0.11$  mg/mL) and d 2 for IgG ( $29.56 \pm 1.56$  mg/mL). Maximum concentrations of IgG and IgM were not affected by EV Rank. However, peak concentration of IgA was affected by EV Rank ( $P<0.02$ ) with calves ranked 1 having the highest IgA values and calves ranked 3 having the lowest. All Igs decayed ( $P<0.01$ ) after reaching maximum values. Serum concentration of C was highest on d 0 ( $14.6 \pm 0.9$  ng/mL) and was not affected by EV Rank. Serum IgG ( $r = -0.34$ ,  $P<0.01$ ) and IgM ( $r = -0.15$ ,  $P<0.01$ ) concentrations were negatively correlated with C concentrations. These results suggest that temperament can affect aspects of passive immunity and early growth in the calf.

**Key Words:** temperament, passive immunity, cortisol

**35 Sequence of the goat urea transporter, UT-B and its expression in the rumen, kidney, intestine, and liver.** J. Hicks\*, G. Huntington, J. Erichsen, and H. C. Liu, North Carolina State University, Raleigh.

Our objective was to determine the nucleotide sequence of UT-B as well as its expression, in ruminal, intestinal, renal, and liver tissues from 10 wether goats. The movement of urea across cell membranes is involved in two metabolic processes, urea concentration or nitrogen

salvaging. Two genes, *SLC141* and *SLC14A2* encode urea transporters. *SLC14A2* encodes six splice variants of UT-A, which are mostly expressed in the kidneys and urinary tract, while *SLC141* encodes UT-B, which is more widely expressed. Because rumen microbes ferment substantial portions of dietary protein to ammonia and short-chain fatty acids, the process of nitrogen salvaging is vital for protein synthesis, in the rumen and in the ruminant. In ruminants urea produced in the liver is transported into the digestive tract where it is hydrolyzed during the nitrogen salvaging process. A cDNA encoding UT-B has been cloned from the bovine rumen (gi:56606557). The bovine UT-B sequence was used to design primers for PCR amplification of cDNA synthesized from goat rumen total mRNA. For RT-PCR mRNA from the kidney and intestine was also included for comparison. Quantitative RT-PCR analysis revealed that UT-B is more highly expressed in both the ventral and dorsal rumens than in kidney, intestine, and liver. For sequencing purposes, the PCR products of goat rumen UT-B cDNA were cloned into the pCR-II vector and subjected to sequencing. The coding region of the goat UT-B mRNA consists of 1,155 nucleotides and shares 94% homology with bovine UT-B. The predicted amino acid sequence from this gene shares 98% homology with the bovine sequence. This high degree of conservation suggests there are similar active urea transport systems in cattle and goats.

**Key Words:** urea transporter, RT-PCR, cDNA

**36 Assessment of oxidative stress markers in heifers grazing endophyte-infected tall fescue.** N. Burke\*<sup>1</sup>, G. Scaglia<sup>2</sup>, D. Blodgett<sup>1</sup>, K. Saker<sup>1</sup>, O. Abaye<sup>2</sup>, and W. Swecker, Jr.<sup>1</sup>, <sup>1</sup>Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA, <sup>2</sup>Virginia Tech, Blacksburg.

Tall fescue (*Festuca arundinacea* Schreb.), a predominant forage for grazing cattle in Virginia, is commonly infected with the fungal endophyte, *Neotyphodium coenophialum*. Although this fungus acts in a mutualistic way to improve plant hardiness, it also produces alkaloids that are detrimental to grazers. The objective of this study was to evaluate fescue toxicosis as a model of oxidative stress in cattle. Crossbred Angus heifers ( $n=34$ ;  $329 \pm 13.7$  kg) were allotted by weight to four blocks consisting of endophyte-infected (E+) and endophyte-free (E-) fescue pastures. Monthly, in June, July, and August, temperature loggers were fixed into blank CIDR and inserted into heifers ( $n=16$ ) for two days. Blood was collected via jugular venipuncture, and peripheral blood mononuclear cells were isolated for analysis of glutathione peroxidase (GPx) activity, glutathione reductase (GR) activity, and reduced:oxidized glutathione. Plasma malondialdehyde (MDA) was evaluated as a marker of lipid peroxidation. Data were analyzed using repeated measures with pasture as the experimental unit, and block as a random effect. In August, heifers grazing E+ exhibited higher ( $P=0.02$ ) afternoon temperatures ( $39.4 \pm 0.16^\circ\text{C}$ ) than heifers grazing E- ( $38.8 \pm 0.16^\circ\text{C}$ ). In June, GR activity of all heifers ( $31.1 \pm 2.2$  mU/mg protein) was higher ( $P=0.02$ ) than in July or August ( $24.3 \pm 2.1$  and  $28.8 \pm 1.9$  mU/mg protein, respectively). Reduced:oxidized glutathione was also higher ( $P<0.0001$ ) in June than in July and August. In June and August, GPx activity of all heifers ( $75.2 \pm 5.8$  and  $71.5 \pm 7.6$  mU/mg protein, respectively) was higher ( $P<0.003$ ) than in July ( $52.9 \pm 3.5$  mU/mg of protein). No treatment or date effects were detected for MDA. Using these markers, differences in oxidative stress were not detected between heifers grazing E+ and heifers grazing E-.

**Key Words:** fescue, endophyte, oxidative stress

**37 Effects of timing of weaning in a fall-calving system on performance of beef cows and their progeny.** M. D. Hudson\*, J. P. Banta, D. S. Buchanan, and D. L. Lalman, *Oklahoma State University, Stillwater*.

Predominantly Angus beef cows were used in two consecutive years to investigate the effects of timing of weaning on cow body weight and condition, reproductive performance, and calf performance of fall-calving beef cows and their progeny. Cows were assigned to two weaning treatments: (1) Traditional weaning in mid-April at approximately 210 d of age (APRIL) and (2) Late weaning in mid-July at approximately 300 d of age (JULY). Performance data were analyzed by number of years on trial: (1) Cows/calves in their first year on trial (YOT=1) and (2) Cows/calves in their second year on trial (YOT=2). Timing of weaning did not significantly influence performance of YOT=1 cows, however APRIL cows tended to have higher BCS than JULY cows at the July weaning date (6.5 vs 5.9,  $P=0.14$ ). In their second year on trial, APRIL cows were 37.7 kg heavier ( $P<0.05$ ) with 0.8 units greater BCS ( $P<0.01$ ) at the July weaning date and 33.6 kg heavier ( $P<0.10$ ) and 0.7 units greater BCS ( $P<0.01$ ) at pre-calving than JULY cows. Percent pregnant did not differ between treatments for YOT=1 or YOT=2; however APRIL cows calved 8 d earlier in the next calving season. Calves born to YOT=1 cows after weaning treatments were applied did not differ significantly for any pre-weaning or weaning traits measured. Progeny of JULY cows out-gained APRIL calves from April to July ( $P<0.10$ ) and were heavier in July, but ADG from birth to July did not differ between treatments. Progeny of APRIL YOT=2 cows tended to be heavier throughout the preweaning period and were heavier (201.1 kg vs 181.9 kg,  $P<0.05$ ) in April compared to JULY progeny. Although JULY calves had greater ADG from April to July ( $P<0.01$ ), final wt in July did not differ between treatments. Time of weaning does not influence July calf weight. However, late weaning may cause decreased cow reproductive efficiency over time.

**Key Words:** fall-calving, weaning, performance

**38 Digestibility of 'Coastal' and 'Tifton 85' bermudagrass, and 'Florigraze' perennial peanut hays in mature horses.** J. V. Eckert\*, R. O. Myer, L. K. Warren, and J. H. Brendemuhl, *University of Florida, Gainesville*.

Two bermudagrass (*Cynodon dactylon*) hays, 'Coastal' (CB) and 'Tifton 85' (T85), and 'Florigraze' perennial peanut (PP; *Arachis glabrata*) hay were evaluated and compared for apparent digestibility (D) of DM, OM, energy (DE), NDF, and CP in mature horses. Six mature Thoroughbred and Quarter Horse geldings (mean initial BW  $542 \pm 36.6$  kg) were used (five for the last period) in a 3X3 Latin square design with two horses per hay and three adjustment and collection periods. Hays were rotated among the horses so that each horse received each of the hays once. Horses were randomly assigned into pairs and randomly assigned initial hay to be fed. Each period of the trial consisted of a 14 or 10 d adjustment period followed by a 4 d total fecal and urine collection. Horses were fed 1.7 (period 1 and 2) or 2% (DM basis) of their BW daily. The bermudagrass hays were grown under similar conditions with CB cut at 4 wk maturity and T85 at 5 wk; PP was of a late first cutting. The compositions of PP, CB, and

T85, respectively, were 89, 94, and 91% DM; 80, 89, and 85% OM; 46, 73, and 77% NDF; 73, 50, and 53% ADF; and 12, 10, and 9% CP. All hays were readily eaten by the horses except for T85 when offered at 2% BW. Apparent digestibilities were evaluated using PROC GLM of SAS and compared with contrasts. Least square means ( $\pm$  SE) for apparent digestibility for PP, CB, and T85, respectively, were: 66, 54, and 54% ( $\pm 2.5$ ) DMD; 65, 55, and 53% ( $\pm 3.1$ ) OMD; 60, 50, and 50% ( $\pm 2.8$ ) DE; and 46, 52, and 49% ( $\pm 3.8$ ) NDFD; 67, 61, 59% ( $\pm 2.4$ ) CPD. Digestibilities of DM, OM, and DE were found to be greater ( $P<0.02$ ) for PP than for CB or T85. Digestibility of CP was also greater ( $P<0.04$ ) for PP than CB or T85, with no difference ( $P>0.3$ ) found among the hays for NDFD. There were no statistical differences between CB and T85 ( $P>0.5$ ). Results indicated that 'Florigraze' PP and T85 are suitable forages for horses.

**Key Words:** horses, bermudagrass, perennial peanut

**39 Three-dimensional analysis of the walk and running walk of the Tennessee Walking Horse.** P. E. Roberson\*, S. Zhang, H. S. Adair, and C. J. Kojima, *University of Tennessee, Knoxville*.

A three-dimensional (3-D) motion capture system was adapted for use in characterizing the biomechanics of the running walk, a gait of the Tennessee Walking Horse (TWH) breed. Registered TWH ( $n = 15$ ) were ridden through an arrangement of high-speed digital cameras at the walk (W) and running walk (RW). Infrared reflective markers (65 per horse) were used to track body segments and joint centers. Five trials per gait per horse were recorded. A dynamic 3-D model was created and used to label and track body segments. Temporal stride characteristics and joint angle values were extracted by a custom script file and gait formulas were calculated for each gait per horse. Temporal stride characteristics and gait formulas of both W and RW were found to be similar to those previously reported. Overstride (OS), which has not previously been described, increased from W to RW ( $P < 0.0001$ ). The increase in OS accounted for 96% of the increase in stride length; only 4% of the increase in stride length is due to an increase in step length. Overstride was positively correlated to velocity and stride length ( $P < 0.0001$ ), and negatively correlated to front stance duration, hind stance duration and total stance duration ( $P < 0.0001$ ). A long OS would appear to be related to the flexibility of the proximal hind limb, the pelvis and possibly the lumbar spine. Hind stance duration as a percent of total stride time, advance placement as a percent of total stride time, and advance liftoff as a percent of total stride time did not differ between W and RW ( $P > 0.05$ ), suggesting that the RW is not simply a faster version of W. Three-D analysis allowed for thorough analysis of joint angles. The joint angles of the carpus were highly correlated to stride length, OS, and advance placement ( $P < 0.0001$ ), but were not correlated to velocity ( $P > 0.05$ ). These joint angles and gait events can be viewed as velocity-independent stride characteristics and may be suitable for making comparisons between horses traveling at different velocities. Identification of joint-specific velocity-independent stride characteristics may enhance our ability to associate lameness with an individual joint.

**Key Words:** horse, gait, biomechanics

## Meat Science

**40 Fatty acid composition of muscle lipids of lambs fed fish supplemented diet.** T. Popova\*, P. Marinova, and V. Banskalieva, *Institute of Animal Science, Kostinbrod, Bulgaria.*

The purpose of this study was to study the effect of fish oil (rich of long-chain polyunsaturated fatty acids) on the content of intramuscular fat and fatty acid composition of phospholipid (PL) and triacylglycerol (TG) fractions in *m. longissimus dorsi*, *m. semimembranosus* and *m. supraspinalis* of lambs. The experiment was carried out with two groups of six male lambs each of local Bulgarian Zapadnostaroplaninska sheep breed. The animals were fed for 28 days controlled iso-nitrogenous diets, containing either no added fat (control group) or fish oil, added 2.5% of wet weight of concentrate (experimental group). Fish oil supplemented diet increased the lipid content in *m. longissimus dorsi* and *m. semimembranosus* by 20% and 40%, respectively, accompanied with an elevation ( $p < 0.01$ ) of the relative part of 16:0 in the PL fraction. The lipid content of *m. supraspinalis* did not change, but the levels of 16:0 and 18:0 in the PL fraction decreased ( $p < 0.05$ ), reflecting on a lower proportion of SFA. *M. supraspinalis* of the experimental animals contained more 18:2 and 20:4, and respectively a higher proportion of PUFA than the control animals, while no differences in *m. longissimus dorsi* and *m. semimembranosus* were observed. There was no significance in the sum of muscle MUFA between the two groups as well. The fish oil increased ( $p < 0.001$ ) the sum of  $\omega$ -3 (18:3, 20:5, 22:5 and 22:6) fatty acids in the PL fraction of all three muscles, where the ratio  $\omega$ -6/ $\omega$ -3 was significantly reduced ( $p < 0.01$ ). No differences in the fatty acid composition of muscle TG between the control and experimental groups were found. In conclusion, the obtained data indicate that a potential effect of fish oil supplemented diets might involve changes in meat fatty acid composition more desirable of human health standpoint, in a muscle-specific way.

**Key Words:** lambs, fish oil, fatty acid

**41 Fatty acid composition, including CLA's isomers and cholesterol content of *m. longissimus lumborum* and *m. semimebranosus* of Katahdin, Suffolk, Katahdin  $\times$  Suffolk, and Suffolk  $\times$  Katahdin lambs.** G. Davila El Rassi\*<sup>1</sup>, V. Banskalieva<sup>1</sup>, R. Albers-Nelson<sup>1</sup>, M. Velasco<sup>1</sup>, M. Brown<sup>2</sup>, and C. Roy<sup>1</sup>, <sup>1</sup>*Oklahoma State University, Stillwater*, <sup>2</sup>*USDA-ARS, Grazinglands Research Laboratory, Reno, OK.*

Six lambs per breed group - Katahdin (KK) and Suffolk (SS), and their crossbred Katahdin  $\times$  Suffolk (KS), and Suffolk  $\times$  Katahdin (SK) lambs were pasture raised. Two months prior to harvest, lambs were fed a high-concentrate diet and were slaughtered at 248 d of age. The cholesterol content, fatty acid composition (FAC), including CLA's isomers were analyzed in *m. longissimus lumborum* (LL) and *m. semimebranosus* (SM). There was no significance in the cholesterol content (57 - 67 mg/100 g tissue) among the muscles and breed groups. The muscles of SS and SK lambs contained more ( $p < 0.05$ ) SFA than the muscles of KK and KS. In contrast, the proportions of MUFA were higher ( $p < 0.01$ ) in the three KK, KS and SK breeds, compared to SS lambs. The proportion of SFA was greater ( $p < 0.001$ ) in m.LL than in m.SM, whereas the content of MUFA was similar in the two muscles. The levels of omega-3 fatty acids were not different between muscles and among the breeds. The sum of omega-6 fatty acids in both muscles of KK, KS and SK was lower ( $p < 0.01$ ) than SS, reflecting on a lower ( $p < 0.01$ ) omega-6/omega-3, ratio in these groups. The ratio PUFA/SFA did not differ between KK, KS and SS, but was lower ( $p < 0.05$ ) in SK. The content (mg/100g tissue) of the main 9-cis,11-trans CLA isomer in the muscles of KK, KS and SK lambs was two times higher ( $p < 0.01$ ) than in the muscles of SS animals. Across all breeds, no differences in CLA content between muscles were observed. The inherent breed characteristics of KK and SS lambs seemed to influence the CLA content and muscle FAC of the crossbred KS and SK lambs. Higher concentrations of  $\omega$ -6/ $\omega$ -3 and CLA in pure bred KK reflected positively in the crossbred KS and SK, suggesting that the Katahdin breed may be a useful foundation for crossbreeding in US lamb production.

**Key Words:** lamb, cholesterol, fatty acid

## Pastures and Forages

**42 The effects of supplementation and forage source on performance of steers during fall backgrounding.** C. Coffey<sup>1</sup>, D. L. Lalman\*<sup>2</sup>, D. Childs<sup>1</sup>, M. D. Hudson<sup>2</sup>, and S. J. Winterholler<sup>2</sup>, <sup>1</sup>*Noble Foundation*, <sup>2</sup>*Oklahoma State University.*

Fertilization of bermudagrass pasture during late-summer has the potential to reduce input costs and improve animal performance when stocker calves are purchased during late-summer and backgrounded until winter annual pasture is available. This experiment was conducted near Ardmore, Oklahoma over a three-year period. Six hundred nineteen beef steers (initial weight = 211 kg) were purchased during August each yr, processed, and backgrounded for a 30-d period before being assigned to one of four treatment combinations. Main effects in this 2X2 factorial design were two forage sources and two levels of supplement. Forage sources were bermudagrass hay and fertilized, stockpiled bermudagrass forage. Levels of supplement included 1.82 kg per head per d of a 14% protein supplement and no supplement.

Experimental units were six pasture or pen replications within each treatment combination each yr. Average initial forage availability in mid-September ranged from 5,436 to 8,468 kg per ha. Stockpiled bermudagrass nutritive value was generally higher during the early part of the grazing period and declined through the fall months. Consequently, steers grazing stockpiled bermudagrass forage gained at a faster rate ( $P < .05$ ) during the early part of the grazing period compared to steers consuming hay. However, forage source did not influence wt gains later in the study or overall (ADG = 0.47 kg). Supplementation resulted in a significant ( $P < 0.01$ ) improvement in wt gain during each weigh period and overall, regardless of forage source. Supplemented cattle gained an average of .36 kg more ( $P < 0.01$ ) per d compared to non supplemented cattle resulting in 0.37 supplement G:F. Stockpiled bermudagrass is a viable alternative to feeding hay to steers after weaning or receiving and prior to winter grazing.

**Key Words:** fertilized, stockpiled bermudagrass, supplementation, stocker steers



**43 Perennial versus annual grasses as supplements for gestating beef cows: 3-yr summary.** S. A. Gunter\*, P. A. Beck, J. D. Shockey, C. B. Stewart, and J. M. Phillips, *Southwest Research & Extension Center, University of Arkansas, Hope.*

Research from the SWREC has shown when limit grazing cool-season annual grasses as a supplement in a complementary forage system, energy and CP supplementation is not required and hay requirements are reduced 23% for gestating and lactating beef cows. To further improve the sustainability of complementary forage systems, replacing annual grasses with perennial grasses should prove beneficial. On 17 December 2003, 144 beef cows (BW = 1195 ± 25.4) were divided into 6 groups of 24 stratified by BCS, BW, and age then assigned to graze a forage system for 3 yr. Each forage system (n = 3/treatment) contained 4.9 ha of bermudagrass plus either 2.4 ha of Jessup tall fescue infected with AR542 endophyte (7 hr/d; 0.04 ha/cow/grazing-d) or 2.4 ha of Wintergrazer 70 rye/Passerel Plus ryegrass (winter) and Red River crabgrass (summer; 7 hr/d; 0.04 ha/cow/grazing-d) being limit grazed up to 3 d/wk when forage was available. All pastures had ad libitum access to bermudagrass/dallisgrass hay (9% CP, 54% TDN) from October through April; rye/ryegrass was established by light disking and broadcasting the seed (101 and 22 kg/ha of rye and ryegrass, respectively) into the crabgrass in yr 1 and 2, and no-till drilled in yr 3. In late April, a bull was placed with each group for 60 d and pregnancy determined in September. Grazing system had no effect ( $P \geq 0.37$ ) on cow BW or BCS at any point during the trial. Pregnancy rate with annual grasses (90%) did not differ ( $P \geq 0.75$ ) from cows grazing tall fescue (91%). No differences ( $P \geq 0.45$ ) were noted between calves grazing annual or perennial grasses in weaning weight (208 vs 207 kg, respectively), ADG from birth until May (0.95 vs 0.95 kg, respectively), ADG from May until weaning (0.86 vs 0.86 kg, respectively), 205-d-weight (219 vs 217 kg, respectively) as a result of treatment. Birth weight tended to be greater ( $P = 0.06$ ) for calves on annuals (36 kg) vs perennials (34 kg). Cows grazing complementary forage systems with either annual or the perennial grasses performed similarly. Advantages for either system would result from difference in cost of production.

**Key Words:** tall fescue, beef cows, forage systems

**44 Intake, digestibility, ruminal parameters, and microbial protein synthesis in crossbred steers fed diets based on grass and sorghum silages.** F. H. M. Chizzotti\*<sup>1,2</sup>, O. G. Pereira<sup>1</sup>, S. C. Valadares Filho<sup>1</sup>, M. L. Chizzotti<sup>1,2</sup>, L. O. Tedeschi<sup>2</sup>, M. I. Leão<sup>1</sup>, and D. H. Pereira<sup>1</sup>, <sup>1</sup>Universidade Federal de Viçosa, Viçosa, MG, Brazil, <sup>2</sup>Texas A&M University, College Station.

A trial was conducted with four Holstein x Nelore crossbred steers (225 kg of BW) fitted with ruminal and abomasal cannulas in a 4 x 4 Latin Square design to evaluate the intake and apparent total and partial digestibility of nutrients, ruminal parameters, and microbial protein synthesis. Diets consisted of 60% roughage and 40% concentrate formulated to be isonitrogenous (12.5% CP, DM basis). Treatments consisted of proportions of *Brachiaria brizantha* grass silage and sorghum silage: 100:0; 67:33; 33:67, and 0:100, respectively (DM basis). The daily intake of DM, OM, CP, ether extract (EE), non-fiber carbohydrates (NFC), and TDN increased linearly ( $P < 0.01$ ) as sorghum silage levels increased, whereas NDF intake, kg/d, was not

affected by treatments ( $P > 0.05$ ). However, the intake of DM and NDF had a quadratic effect in which the maximum intakes were 2.49 and 1.01% of BW at 79.6 and 66.1% of sorghum silage, respectively. The apparent total digestibility of DM and OM increased linearly with sorghum silage levels. However, ruminal, intestinal, and apparent total digestibility of CP, EE, NDF, and NFC were not influenced by sorghum silage levels ( $P > 0.05$ ). The highest ruminal ammonia concentration (13.81 mg/dL) occurred at 2.96 h post-feeding whereas the lowest ruminal pH (5.87) was measured at 5.37 h post-feeding. The highest passage rate (4.95%/h) occurred with diets containing 79.6% sorghum silage. Ruminal-degraded OM and carbohydrate, and microbial N synthesis increased linearly with increasing contents of sorghum silage in the diets ( $P < 0.02$ ). However, there was no effect of levels of sorghum silage on microbial efficiency ( $P > 0.05$ ). The use of 67% of sorghum silage and 33% of grass silage increased intake and digestibility of nutrients without affecting ruminal pH, ruminal ammonia concentration, and microbial efficiency.

**Key Words:** microbial efficiency, passage rate, total digestible nutrients

**45 Determination of alkane content in fresh fecal samples to estimate intake on pasture.** S. W. Coleman, E. J. Bowers\*, D. G. Riley, and C. C. Chase, Jr., *USDA ARS Subtropical Agricultural Research Station, Brooksville, FL.*

External markers of wax alkanes C<sub>32</sub> and C<sub>36</sub> are effective tools for determining intake of grazing animals. The technique requires daily dosing of markers which is impractical under extensive grazing conditions, so controlled release capsules (CRC) have been used. However, consistency of payout from the CRC has been questioned. Also, accepted protocols for alkane analysis employing freeze drying or air drying are time consuming. The objective of this study was to evaluate analysis of fresh feces to determine alkane content and CRC payout. Nine lactating cows and 1 ruminally-fistulated steer grazed a Bahiagrass pasture. The steer and 6 cows were dosed with a CRC that is reported by the manufacturer to release approximately 400 mg each of C<sub>32</sub> and C<sub>36</sub> daily. Feces were collected daily from the ground for each animal over the next 30 days and divided into two sub-samples, one immediately analyzed for alkanes and the other one was dried (50°C) and analyzed later. External markers were first detected on d 2 in all dosed animals. The last day of elevated concentrations varied from d 13 to d 23 indicating payout was variable among animals on the same diet. Mean C<sub>32</sub> and C<sub>36</sub> values of dosed animals rose sharply from d 0 (44.1 ppm, 31.9 ppm) to d 3 (117.1 ppm, 108.0 ppm) and remained at those levels until payout ceased. Concentrations of external markers in dosed animals were higher in fresh feces than dry (90.8 vs. 83.1 ( $P < 0.01$ ) for C<sub>32</sub> and 85.1 vs. 76.0 ppm ( $P < 0.01$ ) for C<sub>36</sub>). Fecal concentrations of alkanes naturally occurring in plant tissue were 603.5 vs. 600.6 ppm for C<sub>33</sub> ( $P = 0.66$ ) and 714.9 vs. 725.0 ppm for C<sub>35</sub> ( $P = 0.16$ ) in fresh vs dried samples, respectively. These results indicated that analysis of fresh fecal material was as effective as dry material in determining alkane content. Intake values calculated using constant payout rates for CRCs may be in error due to variable payout, but fresh analysis may facilitate determination of a more accurate payout rate.

**Key Words:** alkane, external marker, payout rate

**46 Effects of planting date and glyphosate application before planting cool-season annual grasses into warm season grass sod on performance of stocker cattle.** P. Beck\*, S. Gunter, M. Phillips, and B. Stewart, *University of Arkansas, Division of Agriculture SWREC, Hope, AR.*

Normally, interseeding of cool-season grasses into warm-season grass sod is delayed until early to mid-October to reduce competition between warm-season grasses and cool-season annual grasses. This research was conducted to determine the impact of an application of low rate of glyphosate herbicide and planting date on performance of growing beef calves grazing interseeded cool-season annual pastures. Twenty, 0.81-ha crabgrass pastures were planted to soft-red winter wheat (cv Roane, 134 kg/ha) and annual ryegrass (cv Marshall, 22 kg/ha) in mid-September or mid-October of 2005 using a no-till drill, with or without an application of 0.5 L of glyphosate at planting. Grazing was initiated on January 18 or February 15 for pastures planted in September or October, respectively. Grazing management was the put-and-take method. Three initial calves (2 heifers and 1 steer; BW = 273 ± 5.4 kg) were used to measure performance and additional calves were added as necessary in order to equalize grazing pressure among pastures. Calf ADG and total BW gain were analyzed using the mixed procedure of SAS (SAS Inst. Inc., Cary, NC) and animal grazing day/ha, and gain/ha were analyzed using the GLM procedure of SAS as a completely randomized design using a 2 x 2 factorial arrangement of treatments. Planting date did not affect ( $P \geq 0.07$ ) overall ADG, but ADG of calves grazing pastures planted in September were 0.28 kg greater ( $P = 0.03$ ) from April to May than ADG of calves grazing pastures planted in October. Glyphosate application at planting increased ( $P \leq 0.05$ ) overall ADG and ADG from mid- February to mid-March. Planting in September with an application of glyphosate increased ( $P \leq 0.01$ ) grazing d/ha by 43 d compared to planting in September without glyphosate application or planting in October with or without glyphosate. Gain/ha was 163 kg greater ( $P \leq 0.01$ ) for pastures planted in September with glyphosate application compared to planting in September without glyphosate application or planting in October with or without glyphosate.

**Key Words:** growing cattle, winter annual grasses, planting date

**47 Injecting anhydrous ammonia into silages to enhance quality attributes.** C. P. Bagley\*<sup>1</sup>, W. D. Becker<sup>2</sup>, and M. E. McCormick<sup>3</sup>, <sup>1</sup>Texas A&M University-Commerce, <sup>2</sup>Texas Cooperative Extension, <sup>3</sup>Louisiana Agricultural Experiment Station.

The injection of anhydrous ammonia (A-NH<sub>3</sub>) into bagged silage would allow variable applications of N to improve crude protein content of feeds. Trials evaluated the effectiveness of A-NH<sub>3</sub> injection into silage for changes in nutrient characteristics and to evaluate animal preference. In Trial 1, A-NH<sub>3</sub> was injected into a 30 t polyethylene bag of sorghum silage at 1% DM. Injection was easily accomplished; the A-NH<sub>3</sub> moved some vertically and horizontally, but dispersion was limited, likely due to excessive moisture in the silage with percentage of CP ranging from 7.9 to 14.1% based on sampling site. In Trial 2, small polyethylene bags with 4 kg of fresh forage were injected with 0, 1 or 2% A-NH<sub>3</sub> on a DM basis and injected either pre-ensiling with or without corn grain or post-ensiling. Silage quality, as measured by percentage of CP (higher) and NDF (lower) was improved ( $P > 0.05$ ) with higher levels of A-NH<sub>3</sub>. Injection of A-NH<sub>3</sub> during post-ensiling phase had no effect ( $P > 0.05$ ) on quality characteristics, but A-NH<sub>3</sub>

volatilization losses occurred during injection due to higher ambient temperatures and poor tools for controlling volatilization losses. Holstein heifers were fed various treated silage combinations and showed no refusals, indicating acceptable silages. Treating silages with A-NH<sub>3</sub> shows potential as a method of increasing CP of silages and improving diet digestibility, but issues of optimum moisture content in silages and timing of A-NH<sub>3</sub> injection should be addressed.

**Key Words:** silage, anhydrous ammonia, quality characteristics

**48 Effects of trace mineral-containing fertilizer application on forage and beef cow performance in Florida.** J.D. Arthington\*<sup>1</sup> and I.V. Ezenwa<sup>2</sup>, <sup>1</sup>University of Florida - IFAS, Range Cattle Research and Education Center, Ona, FL, <sup>2</sup>University of Florida - IFAS, Southwest Florida Research and Education Center, Immokalee, FL.

The objective of this experiment was to assess the effects of a trace mineral-containing fertilizer on performance of both forage and beef cattle in Florida. Pregnant 2-yr old heifers (n = 48) were stratified by BW and assigned to pastures of equal size (1 ha; 4 heifers/pasture). Three treatments were randomly assigned to pastures (4 pastures/treatment), including; 1) trace mineral fertilizer (TMF; 45 kg/ha consisting of 2.3, 1.1, 0.1, and 0.03% Cu, Zn, Co, and Se, respectively; Grasstrac, Helena Chemical Company, Tampa, FL) with no supplemental mineral provided to heifers, 2) no TMF and no supplemental mineral, and 3) no TMF, but supplemental minerals were provided to heifers (56 g/heifer daily). Supplemental stock salt was provided to all heifers not receiving supplemental minerals. Liver samples were collected on d 0, 60, and 120 and analyzed for mineral concentrations. Forage yield, utilization, and quality were determined monthly. Pastures receiving TMF had less ( $P = 0.02$ ) forage yield between d 90 and 120 than in the first month whereas the reverse response occurred for pastures not receiving TMF. Available forage in each pasture was not impacted by treatment (ave. available forage = 2,680 ± 220 kg/ha). Forage utilization did not differ among treatments (ave. utilization = 42.8 ± 3.4 %). Forage Cu concentrations on d 60 were greater in pastures receiving TMF compared to those not receiving TMF. Forage Co concentration on d 30 and 120 was greater ( $P < 0.05$ ) for pastures receiving TMF compared to those not receiving TMF. Cows grazing pastures receiving TMF had lesser ( $P < 0.04$ ) liver Mn and Mo concentrations on d 0, but greater ( $P < 0.06$ ) liver Mn and Mo concentrations on d 60. Despite TMF, forage Cu, Zn, Co, and Se were less than required for cattle (NRC, 1996). Although Cu and Zn were deficient in the forage, corresponding liver concentrations did not indicate a deficiency; however, Se was deficient in both the forage and liver.

**Key Words:** forage, mineral, fertilizer

**49 Effect of pasture management practices on animal performance and nutrient runoff.** P. Beck\*, S. Gunter, M. Anders, B. Watkins, K. Lusby, and D. Hubbell, *University of Arkansas, Division of Agriculture, Fayetteville.*

Agricultural practices have impacted the environment for many centuries. In past generations, agricultural disasters like the Dust Bowl in the 1930's increased awareness about tillage practices and their

impact on the environment. Passage of the Clean Water Act in 1972 set in motion actions that have greatly impacted land use by farms. Most previous research concerning the impact of tillage system on environmental health has focused on crop production with little research to determine the impact of livestock grazing and tillage system on resource sustainability of farms. Rainfall is critical for forage production and can be an important concern when either inadequate or overabundant. Dry conditions limit forage establishment and growth while wet conditions can delay establishment due to crusting of the soil surface and will cause footing problems for livestock. Arkansas research compared tillage systems for establishment of small grain pastures has determined that fall animal gains are greater ( $P \leq 0.04$ ) for no-till compared to conventional or minimum tillage when rainfall is limiting for stand emergence. In years that adequate rainfall is present for stand emergence in the fall, animal gains are not affected by tillage system ( $P \geq 0.14$ ). Rainfall simulators quantified the effect tillage system had on runoff volumes and nutrient content. The time to runoff was increased for no till compared to conventional or minimum till, no till produced only 25.6% of the runoff volume compared to conventional till and 36.6 % of the runoff volume compared to minimum till. The no-till plots only lost 13.9% of the rainfall as runoff compared to 54.2 and 38.0% for conventional till and minimum till, respectively. Total N runoff load was 40% less for no-till vs minimum or conventional tillage and total P runoff load was 88% less for no-till vs conventional tillage. The results of this research indicate that conservation tillage practices are as effective as conventional practices in producing small grain pasture, are less expensive, and significantly reduce environmental impacts.

**Key Words:** small grain, tillage, nutrient runoff

**50 What is the cost of gain for stocker cattle on ryegrass pasture?** D. G. St. Louis\*<sup>1</sup> and R. D. Little<sup>2</sup>, <sup>1</sup>South Mississippi Experiment Station, Poplarville, MS, <sup>2</sup>Mississippi State University, Mississippi State.

Physical and economic aspects of three feeding treatments were measured using 194 beef steers in a completely randomized design with three years as replicates. The treatments were: 1) drylot feeding with no pasture (DRYLOT), 2) winter annual ryegrass (*Lolium multiflorum* Lam.) pasture stocked initially at 535 kg/ha bodyweight (RG1), and 3) ryegrass pasture stocked at 803 kg/ha (RG2). Cattle weighed 234, 175 and 182 kg/head when purchased in yr 1, 2 and 3, respectively. A Total Mixed Ration (TMR) was fed ad-libitum to steers in the DRYLOT treatment. It was formulated with the aid of linear programming software and the Cornell Net Carbohydrate and Protein System model to minimize the feed cost of gain (COG). The TMR changed as ingredient costs changed so that NEg ranged from 1.04 to 1.12 Mcal/kg and CP ranged from 14.0 to 22.1%. Prepared seedbed pastures for RG1 and RG2 were drilled with Jackson ryegrass seed in September and fertilized to provide 29 kg/ha of nitrogen (N) plus phosphorus and potassium. Additional N at 61 kg/ha was applied in November and January, except in yr 3 due to drought and late stand establishment. One week before ryegrass pasture was judged to limit intake of animals grazing in RG1 and RG2 (5 cm), the TMR used in the DRYLOT treatment was fed ad-libitum without removing cattle from pasture. When grazing was judged to be adequate (13 cm) feeding of the TMR was discontinued. Feeding the TMR was not necessary for RG1 in year 1. Treatments were not different for ADG computed using purchase and sale weights ( $P=0.43$ ). The ADG for yr 1, 2 and 3 was 1.57, 1.45

and 1.62 kg, respectively ( $P<0.001$ ). The total COG (variable and fixed costs included) was \$1.12, \$1.07 and \$0.93 per kg for DRYLOT, RG1, and RG2, respectively ( $P=0.25$ ). Owners of the cattle did not pay enough on weight gain contracts (\$0.77/kg to \$0.88/kg) for land owners to recover their costs under the conditions of this study. The TMR was effective for supplementation of pasture and for increasing stocking rates.

**Key Words:** stocker cattle, total mixed ration, cost of gain

**51 Agronomic performance and beef cattle grazing preference of three prairie bromegrasses (*Bromus* spp.).** A.S. Hubbard\*, J.A. Parish, B. Macoon, R.C. Vann, and J.R. Parish, *Mississippi State University, Mississippi State.*

Prairie bromegrass is a cool-season perennial bunchgrass with potential as a valuable forage crop in the southeastern USA. The objective of this study was to compare dry matter production, persistence, nutritive value, and beef cattle grazing preference of two experimental lines and a commercial species (cv. Matua) of prairie bromegrass. Three prairie bromegrasses: Matua (*B. willdenowii*), BP101 (*B. parviflorus*), and BW103 (*B. willdenowii*) were established in 9.1 by 9.1-m plots with four replications. Seeds were drilled into a prepared seedbed at a rate of -28 kg ha<sup>-1</sup>. Lime, P, and K were applied prior to planting according to soil test. N was applied one month after planting (37 kg N ha<sup>-1</sup>). When each plot accumulated at least 20 cm of growth, quadrats (n=5) were clipped prior to grazing to estimate pre-grazing herbage mass and samples were analyzed for CP, NDF, ADF, IVDMD, and IVTD. Plots were grazed with Hereford x Angus steers (BW=227 kg/hd) at a stocking rate of 8399 kg/ha until the first plot was grazed down to 7 cm in height. Quadrats (n=5) were clipped to estimate post-grazing herbage mass. Herbage disappearance (the difference between pre- and post-grazing herbage mass) was used to determine preference. After each grazing, all plots were clipped to a 7-cm residual stubble height, and N was applied (56 kg N ha<sup>-1</sup>). Grazing was done three times from April through June. Statistical analyses were performed using the PROC MIXED procedure in SAS. Pre- and post-grazing herbage mass differed among harvest dates ( $P<0.01$ ) and treatments ( $P<0.02$ ). There were no differences ( $P=0.40$ ) in disappearance of herbage among prairie bromegrass species, although disappearance of herbage declined ( $P<0.01$ ) with the progressing harvest dates. Chemical composition did differ ( $P<0.01$ ) with the progressing harvest dates but did not differ ( $P>0.07$ ) between species. Beef cattle demonstrated similar grazing preferences among the three prairie bromegrasses in this experiment. Stand persistence will be estimated at the beginning of the next grazing season.

**Key Words:** grazing preference, Prairie Bromegrass, beef cattle

**52 Long-term agronomic and animal performance on stockpiled Jessup tall fescue varying in endophyte status.** M. E. Drewnoski\*, M. H. Poore, E. J. Oliphant, J. T. Green, and M. E. Hockett, *North Carolina State University, Raleigh.*

The objective of this study was two fold. The first objective was to evaluate the long-term agronomic performance of endophyte-infected (E+), endophyte-free (E-) and novel endophyte-infected (EN) tall

fescue when stockpiled and intensively grazed in the winter. The second objective was to evaluate the performance of growing cattle when intensively grazing stockpiled E+, E- and EN fescue. In August of each year the plots (1 ha, 4 per treatment) were harvested for hay and in September they were fertilized with an average of 82.8 kg of N/ha. In December of each year, 48 Angus-cross tester cattle (4 per plot), with average initial body wt 261 kg, were given a daily allotment of forage, under strip-grazing management, with a target residual height of 5cm. Steers were used the first year and heifers were used in subsequent years. Pasture ADG of animals did not differ among the treatments (trt) ( $P = 0.13$ ). Gains were 0.52, 0.59 and 0.56 kg/d for E+, E- and EN, respectively. Forage disappearance (DM) did not differ among trt ( $P = 0.36$ ). Endophyte-free had lower ( $P = 0.01$ ) percent of total fescue (82.5%) in the sward than did the E+ (90.7%) or EN (88.4%) which did not differ ( $P = 0.16$ ). Slight differences among the trts in nutritive composition of the sward were observed. The *in vitro* true dry matter digestibility of the sward differed among trt ( $P < 0.01$ ) with E- having the lowest digestibility (70.7%), EN being intermediate (72.5%) and E+ being the highest (73.9%). Crude protein of the total sward was higher ( $P < 0.001$ ) for the E- (11.8%) than E+ (10.9%) and EN (11.1%) which did not differ ( $P = 0.13$ ). Endophyte status did not influence leaf senescence over the winter. Total forage mass of E- (3508 kg/ha) was lower than E+ ( $P < 0.01$ ) and EN ( $P = 0.01$ ), while E+ (3979 kg/ha) and EN (3829 kg/ha) did not differ ( $P = 0.16$ ). The use of stockpiled E+ as a source of low cost winter feed is a viable option for producers. Novel endophyte fescue appears to have agronomic performance similar to E+ under these conditions.

**Key Words:** endophyte, tall fescue, stockpile

**53 Complimentary forage systems for beef cows.** S. W. Coleman\*, *USDA ARS Subtropical Agricultural Research Station, Brooksville, FL.*

Cow-calf production systems comprise the predominant component of the beef cycle in the southern part of the U.S where almost 40% of the nation's cow herd is located. Calves weaned in this region normally are transported either to the mid-west or the southern plains for growing, finishing, and harvesting. Forage production in the southern U.S. is dominated either by warm-season perennial grasses (Bermudagrass or Bahiagrass) in the Deep South and along the Gulf Coast, or by cool-season perennial grass (Fescue) in the Upper South. These grasses are highly productive during the growing season but are low to moderate in quality. The warm-season grasses die at first frost and do not grow during the winter, whereas Fescue is dormant during the heat of summer. Therefore, cows suited to the region must be able to consume and process large amounts of forage when available, and perhaps to withstand the feast-famine characteristic of the wet-dry tropics. Alternatively, forage systems may be developed to supply green forage through most of the year, and particularly when cows have high demand loads due to lactation or late gestation. These systems often include alternate forage crops to compliment the deficit from the staple forage supply. Examples include legumes, summer annuals, and warm-season perennials in the Fescue belt and winter annuals, legumes, and cool-season perennials in the deep south. The difficulty lies in the grazer's ability to coax plants to grow where they are not particularly well-suited, and to optimize production while minimizing costs. Many of the forage species suitable as complimentary forages have been tested in plots, but information is severely lacking concerning their ability to persist, to withstand drought and other weather stressors, abusive grazing, and other adverse conditions that are often encountered. Systems models could perhaps help identify times of forage deficit and how alternate forage species might be used to fill the deficit.

**Key Words:** forage systems, beef cows

## Physiology

**54 Follicle development, estrous characteristics, and effectiveness of a GnRH/CIDR + PG synchronization protocol in postpartum Angus (AN) and Brangus (BN) cows.** R. D. Esterman\*, B. R. Austin, S. A. Woodall, and J. V. Yelich, *University of Florida, Gainesville.*

Objectives of the experiment were to evaluate ovarian, estrous, and pregnancy responses of two-year old postpartum AN ( $n=30$ ) and BN ( $n=23$ ) cows to a Select Sync synchronization protocol. Mean BW, days postpartum, and condition scores (BCS: 1-9) for AN and BN cows were  $402 \pm 35$  and  $420 \pm 52$  kg,  $98.4 \pm 22$  and  $90.0 \pm 24$ , and  $4.8 \pm 0.3$  and  $5.2 \pm 0.4$ , respectively. On d 0, cows received GnRH (Cystorelin®; 100 µg) concomitant with a CIDR followed by PG (Prostamate®; 25 mg) on d 7. On d 0, 2, 7, and at AI, blood samples were collected to determine estrogen concentrations and transrectal ultrasound exams were also conducted to record luteal structures and follicles  $\geq 5$  mm. Estrus was monitored for 5 d using HeatWatch® and cows were AI 8 to 12 h after detection of estrus. Follicles ovulating to GnRH (ovulating = OV, not ovulating = NoOV) and size of follicles that ovulated were similar ( $P > 0.05$ ) between AN (58.1%, 18/31; 12.5 mm) and BN

(54.6%, 12/22; 11.7 mm), respectively. Largest follicle on d 7 was effected ( $P < 0.05$ ) by ovulation status at GnRH (OV; 11.7; NoOV, 13.6 mm) but not breed ( $P > 0.05$ ) (AN, 12.7; BN, 12.1); whereas, estrogen concentrations on d 7 were effected ( $P < 0.05$ ) by breed (AN, 3.5; BN, 2.4 pg/mL) but not ( $P > 0.05$ ) ovulation status at GnRH (OV; 2.9; NoOV, 3.2 pg/mL). Neither OV vs. NoOV or AN vs. BN effected ( $P > 0.05$ ) largest follicle size at AI (16.1 vs. 16.3 mm; 16.2 vs. 15.7 mm), estrogen concentration at AI (2.9 vs. 3.2 pg/mL; 3.1 vs. 3.1 pg/mL), interval to estrus (62 h 46 m vs. 67 h 8 m; 63 h 46 m vs. 65 h 28 m), estrous response (83.3 vs. 65.2%; 80.7 vs. 68.2%), conception rate (80.0 vs. 80.0%; 80.0 vs. 80.0%), or synchronized pregnancy rate (66.7 vs. 52.2%; 64.5 vs. 54.6%), respectively. Irrespective of ovulation status at GnRH, AN and BN had a similar ( $P > 0.05$ ) interval from PG to estrus but AN had more ( $P < 0.05$ ) mounts (49.0) during estrus and a longer ( $P < 0.05$ ) estrus duration (11 h 4 m) than BN (21.5 mounts; 7 h 20 m).

**Key Words:** follicle, Bos Indicus, synchronization

**55 Administration of GnRH either 3 or 10 d after a 14 d melengestrol acetate (MGA) treatment to synchronize follicle development in Bos indicus × Bos taurus cattle.** S. A. Woodall\*, B. R. Austin, R. D. Esterman, and J. V. Yelich, *University of Florida, Gainesville*.

Two-year-old cycling *Bos indicus* × *Bos taurus* heifers at d 2 of the estrous cycle received MGA (0.5 mg/hd/d) for 14 d, and heifers were randomly assigned to receive GnRH (100 µg; Cystorelin®) either 3 (G3; n = 25; 395 ± 6.3 kg BW) or 10 d (G10; n = 23; 404 ± 6.6 kg BW) after MGA withdrawal with PG (12.5 mg; Lutalyse® Sterile Solution) 7 and 8 d after GnRH, which will be designated as the synchronizing PG treatment (SPG). Within each GnRH treatment, heifers were randomly assigned to receive either no PG (G3, n=6; G10, n=6) or 12.5 mg PG on d 4 and 5 (G3, n=5; G10, n=5), 8 and 9 (G3, n=8; G10, n=7), and 12 or 13 (G3, n=6; G10, n=5) of MGA to initiate luteolysis in order to simulate heifers starting MGA at different stages of the estrous cycle (SOC; Day 2, 14, 10, and 6, respectively). Ultrasound evaluations were performed at GnRH and 48 h later to determine ovulation to GnRH and at SPG to determine size of the largest follicle. Estrus was visually detected twice daily for 7 d after SPG. Following MGA withdrawal, ovulation rate was similar ( $P > 0.05$ ) between G3 (76.0%; 19/25) and G10 (91.3%; 21/23). There tended ( $P = 0.06$ ) to be SOC effects on ovulation to GnRH in G3, but no ( $P > 0.05$ ) SOC effects on ovulation to GnRH in G10. At SPG, size of the largest follicle was similar ( $P > 0.05$ ) between G3 (12.8 ± 0.6 mm) and G10 (13.2 ± 0.6 mm). Following SPG, estrous response was similar ( $P > 0.05$ ) between G3 (92.0%; 23/25) and G10 (82.6%; 19/23). However, more ( $P < 0.05$ ) G3 (76%; 19/25) heifers exhibited estrus during the first 72 h than G10 (43.5%; 10/23) heifers. Eight days after expression of estrus, progesterone concentrations were similar ( $P > 0.05$ ) between G3 (4.8 ± 0.5 ng/mL) and G10 (5.2 ± 0.5 ng/mL) heifers. In summary, GnRH administered 3 d after MGA resulted in a similar estrous response compared to GnRH administered 10 d after MGA, but the G3 estrus was more synchronous than the G10 estrus. (Supported by USDA–TSTAR 2004–34135–14855)

**Key Words:** MGA, synchronization, GnRH

**56 Serum progesterone concentration in ovariectomised Bos taurus cows using new, re-used, or re-used autoclaved CIDRs.** M. D. Eaton\*<sup>1</sup>, C. Rosales-Nieto<sup>1</sup>, J. F. Zuluaga<sup>2</sup>, and R. L. Stanko<sup>1,2</sup>, <sup>1</sup>Texas A&M University-Kingsville, <sup>2</sup>Texas A&M University Agricultural Research Station, Beeville.

Previous research (Zuluaga and Williams, 2006) has shown re-used autoclaved, Eazy-Breed CIDR inserts (Pfizer Animal Health, New York, NY) may be superior to re-used disinfected CIDRs in *Bos indicus* influenced cows. Our objective was to compare serum progesterone (P4) concentrations in ovariectomized (OVX) *Bos Taurus* cows receiving either a new (N), re-used washed (W), or re-used autoclaved (AC) CIDR. Six mature, OVX Hereford cows (673±17kg; BCS 8.9±0.1) were used in a replicated 3x3 Latin square design during March to April. The duration of each replicate was 7 d, followed by a 72 h rest. Treatments were 1) N, 2) W, and 3) AC. Re-used CIDRs were removed and either soaked in 0.03% chlorhexidine gluconate (Novalsan®) for 2 h, washed thoroughly, rinsed, air dried, and placed in a container until use (W) or were washed and autoclaved at 121°C and 724 mmHg for 20 min (AC) prior to use. Blood samples were

collected at 0, 10, 30, 60, 180, and 480 min relative to CIDR insertion, daily until d 7, and at 30, 60, and 180 min relative to CIDR removal. Mean (±SEM) serum P4 concentrations (ng/ml) during the 7-d period differed ( $P < 0.01$ ) between all treatments (N, 3.3±0.7; AC, 2.4±0.5; W, 1.7±0.3). However, mean serum P4 concentrations during the first 24 h were similar between N (4.0±0.6) and AC (3.6±0.5) and both were greater ( $P < 0.01$ ) than W (2.0±0.3). Peak serum P4 concentration (ng/ml) and time (min) to peak were similar between N and AC (6.2±0.9 and 212±86 vs. 5.3±0.8 and 168±68, respectively) and were greater ( $P < 0.05$ ) than W (3.0±0.5 and 3366±1210). Results show that cows receiving N or AC CIDRs receive similar amounts of P4 acutely. However, during a typical 7-d CIDR treatment protocol, N CIDRs delivered a greater amount of P4 than re-used CIDRs. If using a re-used CIDR, producers may consider autoclaving as a useful alternative to washing and disinfecting due to greater release of P4 and enhanced sanitary conditions.

**Key Words:** CIDR, ovariectomized, progesterone

**57 Administration of GnRH 3 d after a 14 d melengestrol acetate (MGA) treatment with PG 7 and 8 d after GnRH for synchronization of yearling Angus and Bos indicus × Bos taurus (BI×BT) heifers.** S. A. Woodall\*, B. R. Austin, R. D. Esterman, and J. V. Yelich, *University of Florida, Gainesville*.

Yearling Angus (n=57) and BI×BT (n=178) heifers at location (LOC) 1 were randomly assigned to treatment with an equal distribution of each breed to a treatment. At LOC 2, BI×BT (n=117) heifers were randomly assigned to treatment. Treatment 1 consisted of MGA (0.5 mg/hd/d) for 14 d with PG (12.5 mg; Lutalyse® Sterile Solution) 19 and 20 d after MGA withdrawal (MGA–PG; n=174) while treatment 2 consisted of MGA (0.5 mg/hd/d) for 14 d with GnRH (Cystorelin®; 100 µg) 3 d after MGA withdrawal and PG 7 and 8 d after GnRH (MGA–G–P; n=178). Within a LOC, PG was administered on the same day for both treatments with estrus detected twice daily for 3 d. Heifers were AI 8 to 12 h after an observed estrus and heifers not detected in estrus by 72 h after PG were timed inseminated (TAI) concomitant with GnRH. A single technician inseminated all heifers at both LOC. Clean-up bulls were placed with heifers 7 d after TAI. Pregnancy was determined by ultrasonound approximately 55 d after TAI. Estrous response, conception, TAI pregnancy, synchronized pregnancy, and 30 d pregnancy rates were similar ( $P > 0.05$ ) between MGA–PG (49.4, 52.3, 25.0, 38.5, and 69.8%) and MGA–G–PG (59.6, 47.2, 16.7, 34.8, and 68.9%), respectively. For LOC 1, estrous response tended ( $P = 0.06$ ) to be greater in MGA–G–PG (58.0%; 69/119) than MGA–PG (45.7%; 53/116), and greater ( $P < 0.05$ ) in Angus (64.9%; 37/57) than BI×BT (47.8%; 85/178). Conception rate tended ( $P = 0.08$ ) to be greater for BI×BT (51.8%; 44/85) when compared to Angus (32.4%; 12/37). There was also a treatment × LOC effect ( $P < 0.05$ ) on conception rate. For MGA–PG, conception rates were 41.5% (22/53) for LOC 1 and 69.7% (23/33) for LOC 2; whereas, conception rates for MGA–G–PG were 49.3% (34/69) for LOC 1 and 43.2% (16/37) for LOC 2. In conclusion, synchronized pregnancy rates were similar between MGA–G–PG and the traditional MGA–PG estrous synchronization program. (Supported by USDA–TSTAR–2004–34135–14855)

**Key Words:** melengestrol acetate, synchronization, heifer

**58 Effects of dietary supplementation with omega-3 fatty acids on indicators of semen quality in boars.** M. J. Estienne\* and A. F. Harper, *Virginia Polytechnic Institute and State University, Blacksburg.*

Nutritional strategies for increasing the production of sperm cells would enhance efficiency in commercial studs and augment the distribution of genetic material from superior boars. The objective of this experiment was to determine the effects of dietary supplementation with a source of omega-3 fatty acids on semen characteristics. Yorkshire x Landrace boars, trained to mount an artificial sow and allow semen collection via the gloved-hand technique, were fed 2.2 kg of a fortified, corn and soybean meal-based control diet (n = 12) or the control diet top-dressed with 0.3 kg of an omega-3 fatty acid supplement (JBS United, Inc., Sheridan, IN) (n = 12), daily for 16 wk. Semen was collected and evaluated and libido assessed once weekly. There were no effects of treatment or treatment × week (P > 0.1), on gel-free semen volume (273.4 ± 7.1 mL) and sperm concentration (340.2 ± 8.5 million/mL), or the percentage of progressively motile sperm cells (65.5 ± 2.5%) and sperm velocity (155.7 ± 3.4 μ/s) as determined using a computer assisted sperm analysis system (Hamilton Thorne Research, Beverly, MA). There was an effect of treatment × week for total sperm cells (P = 0.06). For boars that received the omega-3 fatty acid supplement, total sperm cells/ejaculate averaged 84.3 ± 2.3 billion during wk 0 to 7 and increased (P = 0.02) to 95.6 ± 2.3 billion during wk 8 to 15. Control boars averaged 86.4 ± 2.3 billion sperm cells/ejaculate throughout the experiment. Because semen is typically extended to create insemination doses containing three billion sperm cells each, use of the omega-3 fatty acid supplement increased the number of potential AI doses by approximately three per ejaculate after the initial 7-wk supplementation period. Further studies are needed to evaluate actual fertility of semen collected from boars receiving diets supplemented with omega-3 fatty acids. (Study funded by the Virginia Agricultural Council)

**Key Words:** boars, semen, omega-3 fatty acids

**59 Influence of urocortin on luteinizing hormone (LH) release from porcine pituitary cells.** D. J. Jackson<sup>1</sup>, R. Subburathinam\*<sup>1</sup>, C. R. Barb<sup>2</sup>, and N. C. Whitley<sup>1</sup>, <sup>1</sup>*University of Maryland Eastern Shore, Princess Anne,* <sup>2</sup>*USDA-ARS, Athens, GA.*

Pituitary cells from pre-pubertal crossbred maternal-line gilts at 137 ± 1.6 d of age were used in two trials (T1 and T2 with 5 and 7 gilts used, respectively) to determine the influence of the hypothalamic stress hormones, urocortin (UCN), UCN2 and UCN3, on LH secretion. Porcine pituitary cells were collected using enzymatic dispersal and cultured at 100,000 cells/well in 24-well plates. On d 4 of culture in both trials, cells were challenged with 10<sup>-8</sup>, 10<sup>-9</sup>, or 10<sup>-10</sup> M UCN (U8, U9, U10, respectively); 10<sup>-9</sup> M LH-releasing hormone (LHRH) individually or in combination with 10<sup>-9</sup> M UCN (U9L). The T1 cells were also challenged with 10<sup>-9</sup> M LHRH/10<sup>-10</sup> M UCN (U10L) while T2 cells were challenged with additional treatments of 10<sup>-9</sup> or 10<sup>-10</sup> M UCN2 (U2-9 and U2-10) and 10<sup>-9</sup> M UCN3 (U3-9). Four to nine wells per treatment per pig were used in both trials. At 24 h after treatment, media were harvested and assayed for LH using RIA. For treated wells, LH secretion was expressed as a percentage of control and log transformed for analysis. Relative to the control (3.5 ± 0.5 and 7.2 ± 0.9 ng/ml for T1 and T2, respectively), U8, U9 and U10 increased (P < 0.05) LH secretion in T1 and U8 and U10 increased LH

secretion in T2. In addition, LHRH and U9L increased (P < 0.01) LH secretion in both trials and U10L increased (P < 0.01) LH secretion in T1. However, UCN did not alter LHRH-induced LH release in either trial. In T2, U3-9 increased (P < 0.001) LH but neither of the UCN2 concentrations used influenced LH secretion. These results indicate that UCN increased LH secretion directly at the level of the pituitary gland, but did not influence LHRH-induced LH secretion. Therefore UCN, which is secreted in response to stress, does not negatively impact pituitary LH release as seen with other stress hormones.

**Key Words:** gilt, urocortin, pituitary cells

**60 Development of culture conditions for investigating bovine blastocyst development and interferon-tau production.** T. M. Rodina\*, A. M. Brad, P. J. Hansen, and A. D. Ealy, *University of Florida, Gainesville.*

In the bovine conceptus, interferon-tau (IFNT) is produced by the trophectoderm and acts on the endometrium to block the pulsatile release of prostaglandin F2 alpha and prevent luteolysis. The overall goal of this work is to develop a culture system that supports embryonic development after blastocyst formation and that can be used to study regulation of IFNT secretion. The effects of medium type (M199 vs KSOM) and oxygen concentration (5% vs 20%) were evaluated. On day 8 after in vitro fertilization (IVF), individual expanded blastocysts were placed in 30 μl drops of KSOM or M199 containing 5% fetal bovine serum (FBS) and incubated at 38.5°C in a 5 or 20% oxygen environment for 72 h. Embryos were visually scored for overall quality and processed to determine the total cell number and the percent of apoptotic cells. Antiviral activity from conditioned medium was assayed to determine IFNT content. Overall quality score was greatest (P < 0.05) for blastocysts cultured in M199/5% oxygen. None of the treatments affected percentage of blastomeres that were TUNEL positive. Regardless of medium type, IFNT concentrations were greater (P < 0.05) for embryos cultured in 20% oxygen than for those cultured in 5% oxygen. In a second study, effects of different concentrations of FBS on blastocyst cell number, apoptosis, and IFNT secretion were evaluated. Blastocysts incubated from day 8 to 11 post-IVF at 5% oxygen in M199 supplemented with serum substitute (ITS), 1% BSA or 1% FBS contained fewer (P < 0.05) blastomeres and increased (P < 0.05) percent apoptotic nuclei compared to blastocysts incubated with 2.5% and 5% FBS. In summary, medium type (M199), oxygen environment (5%), and serum supplementation requirements (2.5%) for maintaining individual blastocyst development until day 11 post-IVF have been identified. This system currently is being used in conjunction with growth factor treatment to describe how uterine-derived factors affect embryo development and IFNT production after blastocyst formation.

**Key Words:** interferon-tau, in vitro fertilization, embryo culture

**61 The expression of fibroblast growth factor (FGF) receptors and ligands in elongated bovine conceptuses.** F. N. T. Cooke\* and A. D. Ealy, *University of Florida, Gainesville.*

A series of developmental events must occur in the bovine conceptus during early pregnancy. Notably, the trophectoderm must secrete

interferon-tau (IFNT), the maternal recognition of pregnancy factor, for pregnancy success. In ruminants, FGF2 has been shown to stimulate IFNT production by the endometrial epithelium and its secretion into the uterine lumen during early pregnancy. Other members of the FGF family are involved in placental formation and function in many mammals but their roles during pre-attachment bovine conceptus development remains unknown. FGF actions are exerted through binding to specific receptors (FGFR). Multiple receptor isoforms are generated by alternative splicing of an extracellular immunoglobulin-like domain (IgIII), which specifies FGF ligand binding. The objectives of this study were 1) to identify the FGFR expressed by d17 bovine conceptuses and a bovine trophectoderm cell line (CT1), and 2) to identify candidate FGF that may interact with these receptors. The total cellular (tc) RNA was extracted from d17 bovine conceptuses and CT1. RT-PCR was performed using primer sets that amplify the IgIII region of FGFR1, 2 and 3. Amplified products were cloned and sequenced. All three FGFR were detected in elongated conceptuses and CT1. Sequence analysis indicated that these FGFR represented the R1IIIc, R2IIIb, and R3IIIc isoforms. In a second study, RT-PCR, cDNA cloning and DNA sequencing was completed to determine if mRNA for FGF1, 2, 7 and 10, a subset of FGF that interact with the identified FGFR, is present in d17 bovine conceptuses and endometrium. FGF1, 2 and 10 mRNA were detected in conceptuses and endometrium. In contrast, FGF7 mRNA was detected only in endometrium. In summary, at least three distinct FGFR reside within the elongated bovine conceptus and cultured bovine trophectoderm. Moreover, at least four candidates FGF are expressed by the conceptus and/or endometrium during early pregnancy. Further studies are required to examine how these ligands interact with their receptors to regulate conceptus development in cattle and other ruminants.

**Key Words:** bovine, FGF, FGF receptor

**62 Effect of fish oil on adipocyte size distribution in different fat depots of lambs.** V. Vasileva\* and P. Marinova, *Institute of Animal Science, Kostinbrod, Bulgaria.*

This study was carried out to investigate the effect of fish oil on the adipocyte size distribution in different fat depots of lambs of local Bulgarian Zapadnostaroplaninska sheep breed. Two groups of six male lambs (age of 3 months) each were fed for 28 days the same iso-nitrogenous diets (forage/concentrate; 65/35), containing either no added fat (control) or fish oil, added 2.5% of wet weight of concentrate. Dietary fish oil did not influence the average diameter of fat cells of internal fat depots (caul, sweetbread and perirenal), and in the fat over m. *longissimus dorsi*, whereas the average diameter of fat cells in breast, intermuscular and tail adipose tissues increased significantly ( $p < 0.05$ ) by 22%, 24% and 31%, respectively. Fish oil supplemented diet had a noticeable affect on the average size distribution of adipocytes in the different fat depots. The higher fat deposition in all fat depots of the experimental animals was accompanied with a dramatic reduction of the population of the smallest adipocytes, being over 90% ( $p < 0.05$ ) in caul and perirenal adipose tissue. Also, the proportion of cells with a diameter between 29 and 39  $\mu\text{m}$  decreased in all fat depots. In contrast, fish oil supplementation stimulated formation of cells of a larger diameter, although to a different extent in the single fat depots. The majority proportion of cells with a diameter between 39 and 49

$\mu\text{m}$ , was elevated over 70% in the perirenal and intermuscular fat of the experimental animals, whereas no change in adipocytes size in fat over m. *longissimus dorsi* was observed. The highest increase of the proportion of larger (between 49 and 59  $\mu\text{m}$ ) and very large (59 to 69  $\mu\text{m}$ ) cells was found in breast (twice as high,  $p < 0.05$ ), intermuscular fat (over 5 times more,  $p < 0.05$ ), and lowest increase by 60% ( $p < 0.05$ ) in fat over m. *longissimus dorsi*, while the changes in the other fat depots were intermediate. The data obtained indicate that the effect of fish oil (rich in polyunsaturated eicosapentaenoic and docosahexaenoic fatty acids) on the adipocyte size distribution and fat deposition in lambs varied among the depots in a depot-specific way.

**Key Words:** lambs, fish oil, adipocyte

**63 Determination of creatinine excretion and evaluation of spot urine sampling to assess purine derivative excretion.** M. L. Chizzotti<sup>1,2</sup>, S. C. Valadares Filho<sup>1</sup>, R. F. D. Valadares<sup>1</sup>, F. H. M. Chizzotti<sup>1,2</sup>, L. O. Tedeschi<sup>2</sup>, M. I. Marcondes<sup>1</sup>, and M. A. Fonseca<sup>1</sup>, <sup>1</sup>Universidade Federal de Viçosa, Viçosa, MG, Brazil, <sup>2</sup>Texas A&M University, College Station.

Four experiments were carried out to determine urinary creatinine excretion in Holstein growing bulls, lactating cows, and replacement heifers. In addition, we evaluated the use of purine derivatives (PD) collected at 4 h after feeding (spot sampling technique) to estimate microbial protein synthesis. In Exp I, 15 lactating cows were used in a randomized block design to evaluate the span of time for total urine collection (3, 6, 9, 12, 15, 18, 21, and 24 h) on creatinine excretion. In Exp II, four bulls were allocated in a 4 × 4 Latin Square to evaluate the effect of diet on excretion of creatinine. These bulls were fed four diets containing levels of cottonseed hulls (0, 10, 20, and 30% of the DM). In Exp III, 15 lactating cows were used to evaluate the effect of milk production (ranging from 3.9 to 36.7 kg/day) on daily creatinine and PD excretions. In Exp IV, 22 replacement heifers were utilized to evaluate the effect of BW (ranging from 107 to 545 kg) on daily creatinine and PD excretions. For all experiments, total urine collections were made over 24 h and daily creatinine and PD excretions were determined. Different span of time for total urine collection had no effect ( $P = 0.70$ ) on creatinine excretion compared to the 24 h collection period. The roughage source did not influence ( $P = 0.64$ ) creatinine excretion by bulls, averaging 28.0 ± 0.9 mg/kg BW. Similarly, milk production did not affect ( $P = 0.82$ ) creatinine excretion in cows, averaging 24.0 ± 0.5 mg/kg BW. In contrast, the creatinine excretion (mg/kg BW) decreased linearly ( $P < 0.001$ ) as BW of heifers increased, suggesting that creatinine excretion might vary with the degree of maturity of growing animals. There were no differences ( $P > 0.14$ ) between the 24-h total collection and spot sampling technique in estimating daily urinary excretion of PD. Creatinine excretion might be used as a metabolic indicator of the daily excretion of urinary PD in Holstein cattle. The spot sampling technique might be used to estimate microbial protein yield under practical conditions.

[Authors thank the CNPq and FAPEMIG for providing the financial support.]

**Key Words:** microbial protein, total urine collection

**64 Temperament and calf serum protein influence weaning weight in Brahman cattle.** J. C. White\*<sup>1</sup>, J. P. Banta<sup>2</sup>, R. C. Vann<sup>3</sup>, D. A. Neuendorff<sup>1</sup>, A. W. Lewis<sup>1</sup>, T. H. Welsh, Jr.<sup>1</sup>, and R. D. Randel<sup>1</sup>, <sup>1</sup>Texas Agricultural Experiment Station, Overton and College Station, <sup>2</sup>Texas Cooperative Extension, Overton, <sup>3</sup>Mississippi State University, Raymond.

An experiment was conducted to determine the effects of cow temperament (TEMP), cow age, and calf sex on serum protein of calves 24 h after birth (d 1). Additionally, the influence of cow and calf TEMP, serum protein classification, and calf sex, on adjusted weaning weight (WW) were determined. Serum samples were collected from 111 Brahman calves on d 1. Calf BW were obtained at birth and weaning (average age = 172 d); weaning BW were adjusted to 172 d of age using BIF guidelines. Cows were assigned a TEMP score from 1 to 3 (1 being calm, n = 25; 2, n = 61; 3 being temperamental, n = 25) and divided into three age groups: young (< 5 yr; n = 53), mature (5-10 yr; n = 49), and old (>10 yr; n = 9). Based on exit velocity and pen scores 28 d before and at weaning calves were assigned to one of three TEMP groups (calm, n = 21; average, n = 72; and wild, n = 18). Additionally, calves were assigned to serum protein groups based on serum protein on d 1; calves with protein values greater than 1 SD above the mean were assigned to the high group (n = 20), those with values less than 1 SD below the mean were assigned to the low group (n = 22), and all remaining calves were assigned to the average group (n = 69). Serum protein of calves on d 1 was higher (P < 0.05) for calves nursing dams with a TEMP score of 1 or 2 compared with those with a score of 3 (7.02, 7.08, and 5.97 g/dL, respectively; SEM = 0.28). Additionally, serum protein tended (P = 0.10) to be higher for calves nursing young and mature cows compared with those nursing old cows (7.05, 6.93, and 6.08 g/dL, respectively; SEM = 0.42). Calf sex did not influence serum protein on d 1 (P = 0.37). Calves classified as having medium or high serum protein were heavier (P < 0.05) at weaning than calves with low serum protein (180, 171, and 162 kg, respectively; SEM = 5.6). Cow TEMP did not influence WW (P = 0.71). Calves classified as calm or average tended (P = 0.10) to be heavier at weaning than calves classified as wild (176, 173, and 163 kg, respectively; SEM = 5.8). The results of this experiment indicate that increasing serum protein status and improving temperament should result in increased calf performance.

**Key Words:** serum protein, temperament

**65 Evaluation of ultrasound body composition traits as affected by temperament and transportation stress.** R. C. Vann\*<sup>1</sup>, S. T. Willard<sup>2</sup>, T. H. Welsh, Jr.<sup>3</sup>, and R. D. Randel<sup>4</sup>, <sup>1</sup>MAFES-Brown Loam Experiment Station, Raymond, MS, <sup>2</sup>Mississippi State University, Starkville, <sup>3</sup>Texas A&M University, College Station, <sup>4</sup>Texas Agricultural Experiment Station, Overton, TX.

The objective of this project was to evaluate the effects of transportation stress and animal temperament on real-time ultrasound body composition traits in Angus crossbred (n = 68) and Brahman (n = 60) steers. Temperament scores were assigned at weaning, yearling, and prior to departure to the feedlot. Mean exit velocity (travel distance 1.83 m/s) was recorded at weaning, yearling, prior to departure to the feedlot and at feedlot arrival. Three sets of steers were hauled three distances (650, 810 or 1236 km) to a feedlot. Body weights were collected at the same times as the mean exit velocity. Real-time ultrasound measurements for ribeye area, percent intramuscular fat,

rib fat, rump fat and gluteus medius depth were taken on the steers prior to leaving for the feedlot and again upon arrival at the feedlot. An overall temperament score was used which combined temperament scores at weaning and yearling. Statistical analyses were performed using the PROC MIXED procedure of SAS. Overall temperament score affected (P = 0.001) exit velocity and pen temperament score prior to departure to the feedlot. Breed and distance cattle were hauled affected (P = 0.007) exit velocity and percent intramuscular fat at feedlot arrival. In addition, the interaction of breed and distance cattle were hauled affected change in percent intramuscular fat (P = 0.053) and rib fat (P = 0.02) at feedlot arrival. Angus crossbred steers hauled shorter distances had smaller changes in percent intramuscular fat than Brahman steers and Brahman steers hauled the greatest distance had the greatest reduction in rib fat. Pearson correlation coefficients between temperament scores at weaning and yearling were highly correlated (r = 0.72, P = 0.001). Correlation coefficients between overall temperament scores and exit velocity at feedlot arrival were highly correlated (r = 0.71, P = 0.001). These results suggest that hauling stress has negative effects on body composition traits specifically percent intramuscular fat and rib fat. However, due to overall animal stress, overall temperament score did not impact body composition traits.

**Key Words:** beef cattle, transportation stress, real-time ultrasound

**66 Growth and conformation changes in pre-weaning warmblood foals.** S. F. Denham\* and R. K. Splan, Virginia Polytechnic Institute and State University, Blacksburg.

The objective of this study was to quantify conformation changes in 13 pre-weaning warmblood foals from birth to 6 mo of age. Foals were photographed with skin markers placed on the left side over 14 palpable bone and joint locations at 7 d of age and bi-weekly until weaning. Photographs were taken with the camera lens perpendicular to the foal standing on a level surface with cannon bones perpendicular to the ground. Linear measurements included length of neck, front and hind cannon bones, front pastern, back and femur as well as wither and hip height. Angular measurements recorded were scapula, humerus, shoulder, front fetlock, ilium, femur, hip and hock angles. Fixed effects of age of dam, parity and foal birth month were generally non-significant and were not included in the final model. Repeated measures analyses via PROC MIXED in SAS were used to compare trait means at birth, 3 and 6 mo. Correlations among response variables within ages were also calculated. Significance was reported at the P < 0.05 level. As expected, wither height, hip height, neck length and back length increased from birth to 6 mo, with significant differences between means at birth, 3 and 6 mo. Front cannon length increased between birth and 3 mo of age, but not after. No significant differences were observed in hind cannon length among age points. Hock and femur angles were larger at 6 mo than at birth, although changes from birth to 3 mo were non-significant. Front fetlock, scapula and ilium angles did not change across time periods. Long bone lengths were positively correlated with hip and wither height at all measured ages. Shoulder angle was correlated to wither and hip height only at 6 mo. Foals born taller at both wither and hip were more upright in front fetlock angle, though this association was not observed at later ages. Increased femur length was associated with a flatter ilium angle at 3 and 6 mo but not at birth. Warmblood breed registries commonly evaluate pre-weaning foal conformation quality, and resulting scores can heavily influence monetary value of these animals. Characterizing



growth rate and conformation changes may help predict the best age at which to evaluate growing foals.

**Key Words:** horse, growth, height

**67 Effect of rider's weight on temporal stride characteristics of the working trot.** K. Benton, P. E. Roberson\*, and C. J. Kojima, *University of Tennessee, Knoxville.*

The objective of this study was to evaluate the effect of rider's weight on the temporal stride characteristics of a horse performing a working trot. Three Quarter Horse geldings of similar age ( $17.3 \pm 2.7$  yrs) and stature ( $158.5 \pm 0.8$  cm at withers), and two experienced riders of similar weight ( $57.6 \pm 2.7$  kg) were used. Weight (0, 8.9, and 17.9 kg) was added to the rider by means of cylindrical weights contained in a snugly fitting vest. The weight was distributed evenly around the rider's torso. Horses were videotaped while being ridden at a working trot at the three weight levels. At least three recordings (reps) were made for each weight per horse. A mixed model analysis was used to generate least square means. Fixed effects were weight, rider, and rep; horse was considered a random effect. As there was no effect of rep or rider on any variable, they were removed from the model. Dependent variables included duration of stance, suspension, and swing phases, swing/stance ratio, and duration of total stride. The duration of the stance phase was increased as weight increased ( $P < 0.0001$ ). Duration of the suspension phase was decreased as weight increased ( $P < 0.0001$ ). Duration of swing phase was not affected by weight. The ratio of swing time:stance time decreased as weight increased ( $P < 0.0001$ ). Total stride time was increased in a similar weight-dependent fashion ( $P = 0.0033$ ). For the variables that were affected, response varied less among horses when 8.9 kg was added; response was more variable between horses when 17.9 kg was added. While the addition of 8.9 kg appeared to improve gait quality as judged by observed engagement of the hindquarters and improved symmetry of footfalls, subtle lameness could be detected in two out of the three horses at 17.9 kg; this was manifested in the loss of symmetrical timing of footfall. These results indicate that the horses compensated for added weight by increasing stance time and consequently increasing total stride time. Horses responded differently despite similarities in age, breed, and height, suggesting that matching horses to riders based on size alone may not be sufficient to protect from weight-related injuries.

**Key Words:** horse, gait, stride

**68 Short term probiotic supplementation of weaned foals.** N. C. Whitley<sup>1</sup>, P. R. Ryan<sup>2</sup>, B. J. Rude<sup>\*2</sup>, D. Cazac<sup>1</sup>, K. W. Necaie<sup>2</sup>, S. J. Barber<sup>2</sup>, and A. N. Musslewhite<sup>2</sup>, <sup>1</sup>*University of Maryland Eastern Shore, Princess Anne*, <sup>2</sup>*Mississippi State University, Mississippi State.*

Twenty-two mixed breed (17 QH; 5 TB/WB type) weanling foals were used at  $119.8 \pm 2.4$  days of age and  $178.7 \pm 5.6$  kg body weight to determine the effect of probiotics on average daily gain (ADG), fecal consistency and pH, and serum cortisol concentrations. On d-1 (weaning=d0), mares and foals previously kept on pasture and fed a commercial grain diet with bermudagrass hay were moved into individual stalls with dirt packed floors and pine wood shavings.

Mares and foals were allowed ad libitum bermudagrass hay. At weaning, mares were removed from stalls, and foals were fed 643 g of a commercially available foal diet (CP 16%) twice a day and half of the foals were supplemented with a commercially available probiotic product (Fastrack Microbial Pack, Conklin, Inc., Shakopee, MN) at 28.4 g per head/day as suggested by the manufacturer while the other half did not receive the probiotic. On d14 and 28, fecal samples were collected directly from the rectum of each animal and fecal pH was measured and recorded and fecal consistency was scored (0 to 5 with 0=liquid diarrhea and 5=normal/firm). Foal BW were measured and recorded on d-1, 15 and 28 and blood samples were collected for analysis of serum cortisol concentrations by RIA on d-1, 1, 4, 9, 14, 21 and 28. Data for one probiotic-treated foal was removed from analysis due to an unrelated minor injury on d8 that required systemic antibiotic treatment. Foal BW and ADG were not influenced by treatment, but increased over time (day effect;  $P < 0.001$ ), with average body weights of  $178.7 \pm 5.6$ ,  $182.5 \pm 5.3$  and  $190.4 \pm 5.3$  kg on day 0, 15 and 28, respectively for all foals and ADG of  $0.38 \pm 0.07$  kg/day for all foals. Fecal consistency ( $4.19 \pm 0.22$ ) and pH ( $6.8 \pm 0.04$ ) and serum cortisol concentrations ( $3.18 \pm 0.22$  ng/ml for all animals) were also not influenced by treatment. In this study, probiotic supplementation did not impact the variables measured; however, more research is needed to determine other possible effects of probiotic use in horses.

**Key Words:** probiotics, foals, cortisol

**69 Effects of an endotoxin challenge test on physiological responses in weaned foals supplemented with probiotics.** P. L. Ryan<sup>\*1</sup>, B. J. Rude<sup>1</sup>, K. Moulton<sup>1</sup>, K. W. Necaie<sup>1</sup>, S. J. Barber<sup>1</sup>, D. L. Christiansen<sup>1</sup>, F. K. Walters<sup>1</sup>, S. D. Bowers<sup>1</sup>, and N. C. Whitley<sup>2</sup>, <sup>1</sup>*Mississippi State University, Mississippi State*, <sup>2</sup>*University of Maryland Eastern Shore, Princess Anne.*

The objective of this study was to evaluate the benefits of dietary probiotic supplementation of foals by measuring physiological responses following an endotoxin challenge test. Quarter Horse and Thoroughbred foals (4-5 mo) were weaned, individually stalled with free access to hay and water, and given a feed supplement (CP 16%) alone (CON, n=6) or top-dressed with a commercial probiotic preparation (Fastrack Microbial Pack, Conklin Inc.) at 28.4 g/head/d (PB, n=6) for 30 d. On d 29, indwelling catheters were placed in the left jugular vein and iButton<sup>®</sup> data loggers configured to record body temperature at 10 min intervals were placed under the tail-head. On d 30, foals were infused via catheter with lipopolysaccharides (LPS; *E. coli* 055:B5; 30 ng/kg BW). Blood samples for cortisol RIA analysis, infrared ocular thermal images and digital rectal temperatures were obtained at -0.5, 0, 0.5, 1, 1.5, 2, 4, 6, 12, 24 h. Within 1 h of infusion all foals showed stress-induced clinical symptoms (dry cough, recumbency, mild diarrhea). No significant effects of treatment were observed for serum cortisol concentrations or body temperature. However, serum cortisol was numerically higher for CON vs. PB foals at 1.5, 2 and 4 h post LPS infusion and 3 out of 6 CON but only 1 out of 6 PB foals obtained peak serum cortisol concentrations greater than 8 µg/dl. As expected, there was a time effect ( $P < 0.001$ ) for serum cortisol concentrations and foal body temperature. Rectal temperatures (°C) peaked at 1.5 h in both groups (CON,  $38.8 \pm 0.22$ ; PB,  $38.7 \pm 0.15$ ) and returned to baseline 24 h post infusion. Both infrared ocular and data logger temperatures (°C) were positively correlated ( $P < 0.001$ ) with digital rectal temperatures ( $r = 0.48$  and  $0.56$ , respectively). While statistically the results from this trial showed no benefit in supplementing

weaned foals with probiotics, numerically the data suggests that supplementation may impart some benefits under physiologically stressed conditions. Therefore, further investigation in probiotic supplementation of weaned foals is warranted. [Supported by MAFES and Conklin Inc., Shakopee, MN]

**Key Words:** probiotic, equine, endotoxin

**70 Use of infrared thermal imaging to quantify dynamic changes in body temperature following lipopolysaccharide (LPS) administration in dairy cattle.** S. Willard\*, S. Dray, R. Farrar, M. McGee, S. Bowers, A. Chromiak, and M. Jones, *Mississippi State University, Mississippi State.*

Digital infrared thermal imaging (DITI) of the eye has been proposed for measuring body temperature (TEMP) in livestock since DITI of the eye has been correlated to rectal (RT) and vaginal (VT) TEMP previously. The objective of this study was to evaluate the time-course of DITI TEMP measures of the eye with other body TEMP measures following a TEMP increase elicited by lipopolysaccharide (LPS) administration. Non-lactating Holstein cows ( $770.5 \pm 18.9$  kg) were assigned to treatment groups: Control (CON; saline,  $n = 9$ ) or LPS ( $0.2 \mu\text{g}/\text{kg}$  BW i.v.; *E. coli* 055:B5). Eye and nose DITI, RT and VT were acquired ( $^{\circ}\text{C}$ ) as follows: -24, 0 (treatment), every 30 min through 6 h, 12, 24, 36 and 48 h post-challenge. Blood samples (serum) were obtained from cows at -24, 0, hourly through 6 h, 12, 24, 36 and 48 h post-challenge for the determination of cortisol (CORT) by RIA. On the day of challenge, ambient TEMP (AMBT;  $^{\circ}\text{C}$ ) increased ( $P < 0.01$ ) and relative humidity (RH; %) decreased ( $P < 0.01$ ); with a negative correlation between AMBT and RH ( $-0.85$ ;  $P < 0.01$ ). Serum concentrations of CORT for the LPS group peaked at 1 h post-treatment and was  $6.6 \text{ ng}/\text{ml}$  more ( $P < 0.01$ ) than the CON cows at 1 h. By 12 h post-treatment, LPS and CON cows exhibited similar concentrations of CORT ( $P > 0.10$ ). Correlations among RT, VT and eye and nose DITI TEMP were greater ( $P < 0.05$ ) within the LPS group than the CON group. Body TEMP measures were greater ( $P < 0.05$ ) in LPS-treated cows compared to CON cows at 0.5 h for RT and VT, and 2.5 h for eye and nose DITI TEMP, and returned to CON TEMP ( $P > 0.10$ ) by 6 h for RT and VT, and 12 h for eye and nose DITI. The highest mean body TEMP for LPS-treated cows occurred at 3.5 h for eye ( $37.78 \pm 0.23$ ) and nose ( $34.84 \pm 0.29$ ) DITI, and 4 h for RT ( $39.46 \pm 0.23$ ) and VT ( $39.93 \pm 0.12$ ) post-challenge (0 h). In summary, LPS-treated cows exhibited increased CORT, RT and VT within 1 h post-challenge, while DITI eye and nose TEMP were delayed to 2.5 h post-challenge; with a more modest TEMP increase than RT and VT responses. [Funded by the USDA-ARS Biophotonics Initiative].

**Key Words:** body temperature, thermography, cattle

**71 The relationship of temperament and body temperature on immunoglobulin response to vaccination in calves.** N. C. Burdick\*<sup>1</sup>, R. C. Vann<sup>2</sup>, S. T. Willard<sup>2</sup>, R. D. Randel<sup>3</sup>, and T. H. Welsh, Jr.<sup>4</sup>, <sup>1</sup>Texas A&M University-Kingsville, <sup>2</sup>Mississippi State University, Raymond, <sup>3</sup>Texas Agricultural Experiment Station, Overton, <sup>4</sup>Texas Agricultural Experiment Station, College Station.

The relationship of temperament and body temperature on immunoglobulin response to vaccination of calves was studied. Data were

collected 28 days prior to weaning (d -28), at weaning (d 0), as well as 28 (d +28) and 56 (d +56) days after weaning. Calves ( $n = 164$ ) were vaccinated on d -28, d 0, and d +28 using UltraChoice8 (UC), Titanium5 (T5), and Presponse<sup>®</sup>SQ (P). Pen (PS) and chute score (CS), and exit velocity (EV) were determined and scores averaged as a measurement of temperament (TEMP), and rectal body temperature (BT) was also recorded. For determination of PS calves were separated into groups of 3 to 5 in a small pen and their reactivity ranked on a scale of 1 to 5 (1 = calm and 5 = highly reactive). A similar scale was used to determine a calf's reactivity, CS, while held in a chute. For determination of EV, the time (in sec) taken by a calf to transverse 1.83 m (using two infrared sensors) following their exit from a working chute was used to calculate velocity (velocity = distance (m) / time (s)). Blood samples were collected and serum isolated for determination of serum total IgG and vaccine-specific IgG. Total serum IgG and vaccine-specific IgG were determined by sandwich ELISAs and direct ELISAs, respectively, specific for bovine IgG. Calves had the highest TEMP scores and BT on d -28 when compared to all other time points ( $P < 0.01$ ). Calf TEMP was affected by gender as bulls ( $P < 0.05$ ) had lower TEMP at all time points. Calf BT was also affected by gender with steers having the lowest total BT ( $P < 0.05$ ). Vaccine-specific IgG was lowest at d -28 before increasing ( $P < 0.01$ ). There was a positive correlation ( $r = 0.37$ ;  $P < 0.01$ ) between TEMP and BT over time while there was a negative correlation between TEMP and vaccine-specific IgG ( $r = -0.15$ ,  $-0.18$ , and  $-0.09$  for UC, T5, and P, respectively;  $P < 0.01$ ) and BT and vaccine-specific IgG ( $r = -0.20$ ,  $-0.14$ , and  $-0.15$  for UC, T5, and P, respectively;  $P < 0.01$ ). These results suggest that temperament and body temperature can negatively affect the response of calves to vaccination.

**Key Words:** temperament, body temperature, vaccine response

**72 Angus and Romosinuano steers exhibit differential acute phase responses following an endotoxin challenge.** J. A. Carroll\*<sup>1</sup>, C. C. Chase, Jr.<sup>2</sup>, S. W. Coleman<sup>2</sup>, D. G. Riley<sup>2</sup>, D. E. Spiers<sup>3</sup>, J. W. Dailey<sup>1</sup>, and R. R. Reuter<sup>1</sup>, <sup>1</sup>USDA-ARS, Livestock Issues Research Unit, Lubbock, TX, <sup>2</sup>USDA-ARS, SubTropical Agricultural Research Station, Brooksville, FL, <sup>3</sup>University of Missouri, Columbia.

Our primary objective was to elucidate the acute phase response in cattle while evaluating potential genetic differences between two diverse *Bos taurus* breeds [Angus (**AG**) and Romosinuano (**RO**)] in response to an endotoxin challenge. The **RO** is a tropically adapted *Bos taurus* breed developed in the Sinú valley of northern Colombia. Eighteen steers ( $n = 9$  steers/breed;  $299.4 \pm 5.2$  Kg BW) were acclimated to environmentally controlled chambers maintained at thermoneutrality ( $19.7^{\circ}\text{C}$ ) and then fitted with an indwelling jugular catheter one day prior to the endotoxin challenge. The following day, blood samples were collected at 30-min intervals from -2 to 8 h. At time 0, all steers received an i.v. injection of lipopolysaccharide (LPS;  $2.5 \mu\text{g}/\text{Kg}$  BW). Serum samples were stored at  $-80^{\circ}\text{C}$  until analyzed for cortisol (CS) and pro-inflammatory cytokines [tumor necrosis factor-alpha (TNF), interleukin-1 beta (IL-1), IL-6, and interferon-gamma (IFN)]. Data were analyzed using an ANOVA analysis specific for repeated measures. Serum CS and TNF increased ( $P < 0.01$ ) in both groups within 1 h following the LPS challenge. For CS, an overall breed effect ( $P < 0.02$ ) was detected such that the CS response was greater in the **AG** steers as compared to the **RO** steers. A breed x time interaction ( $P < 0.01$ ) was observed for TNF such that the response was delayed and extended in the **RO** steers as compared

to the **AG** steers. At 2 and 2.5 h post-LPS, TNF concentrations were greater ( $P < 0.03$ ) in **RO** steers compared to **AG** steers. For IL-1, a breed x time interaction ( $P < 0.04$ ) was also observed. At 3 h post-LPS, IL-1 concentrations were greater ( $P < 0.01$ ) in **RO** steers compared to **AG** steers, and demonstrated a more pronounced biphasic response. Serum IL-6 and IFN increased ( $P < 0.01$ ) in a similar manner in both groups following the LPS challenge. To our knowledge, these are

the first data to demonstrate differences in innate immunity between two diverse *Bos taurus* breeds and may aid in our ability to elucidate other physiological/immunological mechanisms that contribute to differences in productivity, heat tolerance, disease resistance, and longevity among cattle breeds.

**Key Words:** cattle, immunity, breed effects

## Ruminant Animal Production

**73 The effects of limit grazing method on stocker and feedlot performance of beef calves grazing winter wheat pasture.** M. D. Hudson<sup>\*1</sup>, C. Coffey<sup>2</sup>, D. Childs<sup>2</sup>, and D. L. Lalman<sup>1</sup>, <sup>1</sup>Oklahoma State University, Stillwater, <sup>2</sup>Noble Foundation, Ardmore, OK.

Forage availability is frequently a limiting factor in profitability of winter annual grazing enterprises. Previous research has shown that cattle with restricted access to wheat forage early in the winter exhibited substantial compensatory gain when abundant forage allowed ad-libitum grazing later in winter. Therefore, limit-grazing has the potential to stretch limited, high-quality forage resources further without depressing animal performance. However, little information is available evaluating the effectiveness of different limit-grazing practices. Six-hundred and six beef calves were used in a 3-yr experiment to evaluate the effects of method of limit grazing on stocker and feedlot performance by comparing the effectiveness of three winter pasture grazing practices from early December to late January: 1) Continuous grazing (24H); 2) An allowed 4 h grazing period per 24 h (4H); and, 3) An allowed 8 h grazing period per 48 h (8H). Initial weights did not vary between treatments and averaged 251.4 kg. Grazing method affected ADG for 24H, 4H, and 8H (1 kg, .5kg, and .23 kg, respectively,  $P < 0.01$ ) for the 58-d grazing period. Initial feedlot weight was 290.5 kg, 263.4 kg, and 253.9 kg ( $P < 0.01$ ) for 24H, 4H, and 8H, respectively. Restricting grazing improved feedlot ADG ( $P < 0.08$ ), however, hot carcass weight was reduced by 9.9 kg ( $P < 0.01$ ). Grazing method did not affect ribeye area, yield grade, or quality grade ( $P > 0.10$ ).

**Key Words:** limit grazing, wheat pasture, performance

**74 Use of soybean hulls as a complementary feedstuff for growing cattle on winter rye pasture.** K. E. Hales<sup>\*2</sup>, E. M. Whitley<sup>1</sup>, G. W. Horn<sup>2</sup>, and M. D. Childs<sup>1</sup>, <sup>1</sup>The Samuel Roberts Noble Foundation, Ardmore, OK, <sup>2</sup>Oklahoma Agricultural Experiment Station, Stillwater, OK.

A trial was conducted at the Noble Foundation Red River Demonstration and Research Farm near Burneyville, Oklahoma to determine the effect of different production programs on cattle performance while grazing winter rye pasture. Three hundred crossbred steers and ten rye pastures were used. Steers were allocated randomly, to one of five treatments replicated twice: conventional (CONV); steers grazed rye pasture at an initial stocking rate of 2.5 steers/ha. Additional cattle were purchased and added to CONV to utilize the rapid spring growth of rye. For treatments two, three, and four (SR1120, SR1400 and SR1680) steers grazed rye pasture at stocking rates of 4.7, 6.2, and 7.4 steers/ha, respectively, throughout the trial. Treatments SR1120, SR1400, and SR1680 had ad libitum access to soybean hulls in a self-feeder. Optimum (OPT) steers grazed rye pasture at an initial stocking rate of 3.7 steers/ha, which was determined by measurements of forage

mass prior to turnout and throughout the trial in attempt to maintain a forage mass of not less than 840 kg/ha. The data were analyzed on a pasture basis using ordinary least squares. Non-orthogonal contrasts were conducted for treatments SR1120, SR1400, and SR1680 that included the effect of stocking rate which was partitioned into linear and quadratic effects. There was a direct comparison of CONV and OPT treatments and the average of treatments SR1120, SR1400, SR1680 to the CONV treatment. Measurements of forage mass were analyzed using repeated measures methods and reported using generalized least squares. Average daily gain and gain/steer were not different ( $P > 0.57$ ), whereas gain/ha increased linearly from 520 to 744 to 813 kg/ha as stocking rate increased for treatments SR1120, SR1400, and SR1680, respectively. The use of soybean hulls allowed stocking rates to be substantially increased over the CONV and OPT treatments without decreasing animal performance, and thus resulted in greater gain/ha.

**Key Words:** beef cattle, production programs, rye pasture

**75 Milk quality in beef cows grazing Coastal and Tifton 85 bermudagrass pastures.** V. A. Corriher<sup>\*1</sup>, G. M. Hill<sup>1</sup>, T. C. Jenkins<sup>2</sup>, and B. G. Mullinix, Jr.<sup>1</sup>, <sup>1</sup>University of Georgia, Tifton, <sup>2</sup>Clemson University, Clemson, SC.

Milk quality was determined in a 2-yr 2 x 2 factorial grazing study using Coastal (C) or Tifton 85 (T85) replicated bermudagrass pastures (4 pastures each; 4.86 ha/yr), with (CG) and without (NCG) access by calves to aescynomene creep grazing paddocks ( $n = 4$ ; 0.202 ha). On Jun 10, 2004, and Jun 8, 2005, 96 tester winter-calving beef cows and their calves were grouped by cow breed (9 Angus, 3 Polled Hereford/group), initial cow BW ( $592.9 \pm 70.1$  kg, 2-yr mean), age of dam (AOD), initial calf age ( $117 \pm 20.1$  d), initial calf BW ( $161.3 \pm 30.4$  kg), and randomly assigned to pastures. Tester calf 91-d ADG (kg) for C vs. T85 were: 0.79 vs. 0.94 (SE 0.02,  $P < 0.01$ ), and NCG vs CG: 0.82 vs. 0.90 (SE 0.02,  $P < 0.03$ ). Angus cows ( $n = 40$ ; 5 cows/treatment) were selected for milking by cow BW, breed, AOD, and calf age. Cows were milked once in yr 1 (Aug 10, 2004; d 62) and twice in yr 2 (Jun 28, 2005; d 20; and Aug 9, 2005, d 63). Milk weight (kg) by C NCG, C CG, T85 NCG and T85 CG, respectively were: (Aug 2004) 3.55, 2.38, 2.79, 2.88; (Jun 2005) 3.94, 3.95, 4.04, 3.85; (Aug 2005) 2.15, 2.69, 1.81, 3.03. A forage x creep grazing interaction ( $P < 0.06$ ) occurred for milk weights; and, milk protein (%) was higher for cows on T85 than C (3.42 vs. 2.97;  $P < 0.01$ ), and for NCG than CG (3.36 vs. 3.03;  $P < 0.05$ ). Trends for higher milk fat (%) on T85 than C (3.24 vs. 2.56;  $P > 0.10$ ), and for NCG compared with CG (3.23 vs. 2.57;  $P > 0.10$ ) were recorded. Higher milk fat and protein in cows on T85 pastures contributed to higher calf ADG on T85 pastures.

**Key Words:** forage, calf, milk

**76 Effects of Fermenten<sup>®</sup> supplementation on Brahman-crossbred heifer development.** R. F. Cooke<sup>\*1,2</sup>, D. B. Araujo<sup>1,2</sup>, J. V. Yelich<sup>2</sup>, and J. D. Arthington<sup>1,2</sup>, <sup>1</sup>University of Florida-IFAS, Range Cattle Research and Education Center, Ona, <sup>2</sup>University of Florida-IFAS, Department of Animal Sciences, Gainesville.

Fermenten<sup>®</sup> is a commercial by-product of lysine production and is utilized as a blended peptide-bound and non-protein supplemental nitrogen source for cattle. The objective of this experiment was to investigate the effects of Fermenten<sup>®</sup> supplementation on growth, blood measurements, forage DMI, and reproductive performance of beef heifers. Sixty heifers (Brahman x British; avg. age = 9 mo) were stratified by initial BW and randomly allocated to 12 bahiagrass (*Paspalum notatum*) pastures. Two grain-based supplement treatments were randomly allocated to pastures. Supplements were fortified with either Fermenten<sup>®</sup> (FM) or urea (CT) to achieve a final supplement CP concentration of 16%. Heifer shrunk BW was obtained at the beginning (d 0) and at the end of the feeding phase (d 112). Body volume (length x girth x height) was obtained on d 0, 28, 56, 84, and 112, whereas pelvic area and reproductive tract score were assessed on d 0, 56, and 112. Blood samples were collected on d 28, 56, 84, and 112 for determination of glucose, blood urea nitrogen, IGF-I, and progesterone (P4) concentrations. For assessment of puberty, additional blood samples were obtained 10 d after each collection for P4 analysis. On d 56, 2 heifers were randomly selected from each pasture and placed into individual feeding stations for a 26-d period to determine treatment effects on forage DMI. On d 112, heifers were allocated by treatment into 2 pastures and exposed to bulls for 60 d. Compared to FM, CT had greater pregnancy rate (60.0 vs. 93.1%, respectively;  $P < 0.01$ ), and tended to have a greater number of pubertal heifers by d 112 (53.3 vs. 75.8%, respectively;  $P = 0.08$ ). However, treatment differences were not observed for forage DMI, body growth parameters, and blood measurements. In this experiment, supplementation of Fermenten<sup>®</sup> to yearling heifers did not influence heifer growth and development, but decreased reproductive performance.

**Key Words:** protein, heifer, reproduction

**77 Evaluation of Optigen II<sup>®</sup> as a source of rumen degradable protein for mature beef cows.** J. Wahrmond<sup>\*1</sup>, D. de Araujo<sup>2</sup>, M. Hersom<sup>1</sup>, and J. Arthington<sup>2</sup>, <sup>1</sup>University of Florida, Gainesville, <sup>2</sup>University of Florida, Ona.

Cattle consuming bahiagrass pastures in Florida are often deficient in crude protein. The purpose of this study was to observe the effects of two rumen degradable protein (RDP) supplements (Urea and Optigen) as compared to cows receiving no protein supplementation (Control) while consuming bahiagrass hay. Optigen II<sup>®</sup> (Alltech, Inc., Nicholasville, KY) is a slow-release N source. The delayed availability of N associated with this product was hypothesized to synchronize with the availability of energy from the low-quality forage, thereby increasing DMI and cow performance. Twenty-two open, crossbred cows were individually fed low-quality bahiagrass hay (6.8% CP, DM basis) and supplemented with 0.91 kg of dried citrus pulp (9.0% CP, DM basis) for 56 d. Treatments included: 1) Control (no supplemental RDP;  $n = 7$ ), 2) 0.11 kg Optigen II<sup>®</sup> ( $n = 7$ ), 3) 0.11 kg Urea ( $n = 8$ ). Daily hay intake was recorded, and hay samples from each day were analyzed for DM. Bodyweight and BCS were recorded on d 0, 28, and 56. Blood samples were collected for analysis of blood urea nitrogen (BUN) and glucose concentrations. Rumen fluid samples were collected via vacuum aspiration and analyzed for pH. Supplement

type had no effect on final BW ( $P = 0.78$ ) or final BCS ( $P = 0.94$ ). There were no differences between the three treatments for DMI ( $P = 0.94$ ), DMI as a percent of BW ( $P = 0.86$ ), or blood glucose concentration ( $P = 0.88$ ) on d 56. Supplement type had an effect on mean rumen pH (control > Optigen;  $P < 0.05$ ) across all sampling dates, and BUN on d 28 and 56 (RDP supplements > control,  $P < 0.001$ ). The synchronization of N and energy metabolism in the rumen may be indicated by the decrease in ruminal fluid pH, potentially indicating greater ruminal fermentation and VFA production and decreased BUN in Optigen cows compared to Urea cows.

**Key Words:** supplementation, intake, protein

**78 Evaluation of whole, in-shell peanuts as a supplement feed for beef cows.** R. O. Myer<sup>\*1</sup>, G. M. Hill<sup>2</sup>, G. R. Hansen<sup>1</sup>, and D. W. Gorbett<sup>1</sup>, <sup>1</sup>University of Florida, Marianna, <sup>2</sup>University of Georgia, Tifton.

Two trials, a feeding trial and a digestion trial, were conducted to evaluate the suitability of using whole, in-shell peanuts (WP) as a high fat, energy and protein supplement feed for beef cows. The digestion trial utilized 18 growing beef steers (265 kg avg. initial wt.). The steers were fed hay (bermudagrass) plus one of three supplement treatments -- 1) corn and cottonseed meal mix (50:50; CCSM), 2) corn and WP mix (50:50; CWP), or 3) WP. The supplements were fed at 1.4 kg/head/d. The steer trial was designed to mimic expected usage of WP by beef cows. Hay and diet DM consumption, and apparent digestibility of DM, ADF and NDF were slightly reduced ( $P < 0.05$ ) for steers on the WP treatment compared to CCSM and CWP; CCSM and CWP were similar (87, 86 and 82% for CCSM, CWP and WP, respectively for DM dig.). Digestibility of CP of WP treatment was similar to CCSM. The cow trial utilized 80 mature late gestating, late winter calving cows (573 kg initial BW; 5.5 initial BCS; 3 to 11 yr old) to determine the effects of interval feeding of WP on performance of the cows and their progeny. The cows were fed free-choice bermudagrass hay and 3x weekly either CCSM (50:50) or WP to provide 1.1 kg/head/d. The trial was conducted for two consecutive years (40 cows/yr) and lasted for 85 d from mid-Nov to early Feb of each year. Supplement treatment did not affect BCS (5.5 vs. 5.5), but BW gain over the 85 d tended to be lower for WP vs. CCSM ( $P = 0.09$ ; 36 vs. 49 kg). Subsequent calf birth wt, survival rate and weaning wt, and subsequent cow AI conception rate were not affected by treatment. The WP used in the cow trial averaged ( $n = 4$ ) 93% DM, 21% CP, 38% EE, 27% CF, 2.8% ash, 0.17% Ca and 0.33% P. Results indicate that WP may be a suitable, easy to feed energy and protein supplement for wintering mature beef cows, however, as noted from the steer digestibility trial, some decrease in total diet digestibility may occur.

**Key Words:** beef cattle, supplement feed, whole peanuts

**79 Performance of beef cows fed hay with free-choice whole cottonseed.** G. M. Hill<sup>\*1</sup>, M. H. Poore<sup>2</sup>, and B. G. Mullinix<sup>1</sup>, <sup>1</sup>University of Georgia, Tifton, <sup>2</sup>North Carolina State University, Raleigh.

Supplemental WCS (92.5% DM, 22.4% CP, 54.7% NDF, 72% TDN) and free-choice bermudagrass hay (89.4% DM, 9.8% CP, 79.4% NDF) in hay rings on dormant bermudagrass pastures ( $n = 6$ , 0.89 ha each) were fed for 63 d to determine maximum whole cottonseed (WCS) DMI of beef cows. Non-pregnant cows ( $n = 42$ , initial BW 517.3

± 99.1 kg; age 3.7 ± 1.9 yr) of British breeding (BR, n = 18) and Brahman composite breeding (BC, n = 24); were ranked by BW within breed type (BT), assigned to groups (n = 6; 3 BR and 4 BC cows). Cow groups were randomly assigned to dietary TRT (TRT): Low WCS (LCS; 0.25% initial BW); Medium WCS, (MCS; 0.5% initial BW), and WCS fed free-choice (FCS). Initial and final BW were means of consecutive daily unshrunk BW. On d 1 and d 63, body condition scores (BCS; scale 1 to 9; 5 = avg condition), and ultrasound fat (USF, cm) depth at the 13th rib (UR) and rump (URP) were determined (initial BCS = 4.5 ± 1.1; initial UR = 0.60 ± 0.42; URP = 0.55 ± 0.61). Cow age (CA; yr) and initial BW (kg) were affected ( $P < 0.01$ ) by BT (CA, initial BW, respectively, BR = 4.93, 582.3 vs. BC = 2.96, 479.8, SE = 0.37, 20.2). For 63-d ADG, CA was used as a covariate, and a BT x TRT interaction (Table;  $P < 0.05$ ) occurred, because MCS had lower ADG than FCS for BR cows, but both MCS and FCS had higher ADG than LCS for BC cows. The BCS, UR and URP data were adjusted for initial BW and initial BCS, UR and URP, resulting in consistently higher values for MCS and FCS. The DMI (kg) of hay and WCS on LCS, MCS, and FCS, respectively, were: 1.2, 10.5; 2.1, 13.2; and 4.3, 11.8; with somewhat higher ( $P < 0.20$ ) hay DMI, and higher dietary DMI (Table) for MCS and FCS. Cow ADG was variable, with higher ADG on MCS and FCS for BC cows. Feeding WCS at rates in MCS and FCS increased both hay DMI and body fat in cows.

**Table 1.**

Item	BT	LCS	MCS	FCS	SE	Interaction	$P <$
Dietary DMI, kg		11.8	15.3	16.1	0.67		0.04
63-d ADG, kg	BR	0.58	0.39	0.78	0.61	$P < 0.05$	
	BC	0.37	0.66	0.64			
BCS, d 63		4.4	4.9	4.9	0.12		0.05
UR, d 63 cm		0.67	0.87	0.96	0.06		0.01
URP, d 63 cm		0.61	0.86	0.88	0.05		0.01

**Key Words:** cow, cottonseed, ultrasound

**80 A field study comparing moxidectin and ivermectin 1% injectables in regard to fecal egg count reductions, weight gains and safety in grazing, stocker cattle.** J. G. Powell\*, T. A. Yazwinski, C. A. Tucker, J. Reynolds, and Z. B. Johnson, *University of Arkansas, Fayetteville*.

Recently, a new formulation of moxidectin was made commercially available by Fort Dodge Animal Health, Cydectin 1% Injectable. The objective of this study was to compare the efficacy, safety and benefit of Cydectin 1% Injectable to Ivomec Plus 1% Injectable. Two thousand and twenty-two stocker calves on 10 Arkansas and Missouri farms were placed randomly and evenly into the Cydectin 1% Injectable group or the Ivomec Plus 1% Injectable group. Calves were male, female, or male castrates of mixed breeding, weighing from 109 to 367 kg on d 0. Herd size ranged from 54 to 544, and all calves were carrying naturally acquired infections when they entered the study. All treatments were administered on a unique d 0 for each farm. Weights and observations were obtained on all animals, whereas fecal nematode egg counts and coprocultures were obtained for 20% of the animals from each farm on d 0, 50, and 100. On d 0, there were no differences in strongyle eggs per gram counts (EPG) between treatment groups.

On d 50, Cydectin-treated calves had lower ( $P < 0.05$ ) EPG counts than Ivomec-treated calves on 7 of the 10 farms. On d 100, lower ( $P < 0.05$ ) egg counts persisted for Cydectin-treated calves on 4 of the 10 farms. Overall, EPG counts for Cydectin-treated calves were lower than counts for Ivomec Plus-treated cattle on d 50 and 100 ( $P < 0.05$ ). Weight gains did not vary significantly between treatment groups ( $P > 0.15$ ). On d 0, coproculture data indicated that the primary nematodes comprising the strongyle EPG were *Cooperia*, *Haemonchus*, and *Ostertagia*. On d 50 and 100, moxidectin coprocultures had higher larval percentages as *Cooperia* when compared to ivermectin coprocultures ( $P < 0.05$ ). The egg count and coproculture results suggest that both parasiticides were limited in their ability to control *Cooperia*, and that Ivomec permitted greater ( $P < 0.05$ ) *Haemonchus* patencies post-treatment than did Cydectin.

**Key Words:** moxidectin, ivermectin, parasite

**81 Effect of pelleting on anthelmintic efficacy of sericea lespedeza hay against gastrointestinal nematodes of goats.** D. A. Moore\*<sup>1</sup>, T. H. Terrill<sup>1</sup>, S. A. Shaik<sup>1</sup>, J. E. Miller<sup>2</sup>, J. M. Burke<sup>3</sup>, J. P. Muir<sup>4</sup>, R. Wolfe<sup>4</sup>, and J. A. Mosjidis<sup>5</sup>, <sup>1</sup>Fort Valley State University, Fort Valley, GA, <sup>2</sup>Louisiana State University, Baton Rouge, <sup>3</sup>USDA/ARS/DBSFRC, Booneville, AR, <sup>4</sup>Texas Agricultural Experiment Station, Stephenville, <sup>5</sup>Auburn University, Auburn, AL.

Resistance of gastrointestinal nematodes (GIN) to anthelmintic treatment world-wide has increased pressure to find alternative, non-chemical control methods. Feeding hay of the high condensed tannin (CT) forage sericea lespedeza (SL; *Lespedeza cuneata*) to sheep and goats has reduced GIN fecal egg count (FEC) and worm numbers in the abomasum and small intestines. This effect has been reported with unground (long) and ground hay. Pelleting of ground hay increases ease of storage, transport, and feeding, but heating during the pelleting process could reduce biological activity of CT. Eighteen naturally-GIN-infected 5-6 month-old Kiko-Spanish cross bucks were fed pelleted and ground SL hay and ground bermudagrass (BG; *Cynodon dactylon*) hay diets (n=6 per treatment) in a 5-week confinement trial. The bucks were fed the ground BG (75% of daily intake) plus a pelleted 16% CP commercial goat chow (25% of daily intake) for three weeks, after which 12 animals were switched to ground and pelleted SL hay plus goat chow for four weeks, and then all animals were fed the BG ration for one additional week. Throughout the trial, feces and blood were collected from individual animals weekly to determine FEC and blood packed cell volume (PCV), respectively. All goats were slaughtered at the end of the trial, with adult worms in the abomasum and small intestines recovered, counted, and identified to species. Both forms of SL hay reduced ( $P < 0.05$ ) FEC in goats relative to BG hay-fed animals, with a greater reduction in goats fed the SL pellets. There was no effect on PCV until the final sampling date, when PCV of SL pellet-fed goats increased ( $P < 0.05$ ) compared with the other treatments. Feeding pelleted SL reduced ( $P < 0.05$ ) abomasal worms, primarily *Haemonchus contortus*, relative to the BG hay-fed goats. Worm numbers in the goats fed ground SL hay were intermediate. Pelleting did not reduce efficacy of SL hay against parasitic nematodes and may facilitate the broader use of this forage in small ruminant GIN control programs.

**Key Words:** sericea lespedeza, gastrointestinal nematodes, goats

**82 Grazing behavior does not explain variation in residual feed intake in Brahman heifers.** R. O. Dittmar, III<sup>\*1</sup>, T. D. A. Forbes<sup>2</sup>, T. H. Welsh, Jr<sup>3</sup>, and R. D. Randel<sup>1</sup>, <sup>1</sup>Texas Agricultural Experiment Station, Overton, TX, <sup>2</sup>Texas Agricultural Experiment Station, Uvalde, TX, <sup>3</sup>Texas Agricultural Experiment Station, College Station, TX.

Grazing behavior and its pre-determined relationship with residual feed intake (RFI) was evaluated in Brahman heifers grazing irrigated fescue and ryegrass. RFI was evaluated in 20-mo Brahman heifers (n=25) at Overton. Heifers were fed a pelleted 12% protein ration at 2.2% BW once daily in Calan gates for 77 d. Weekly BW were taken to adjust daily feed allocation. Residual feed intake was calculated using GLM procedures of SAS to calculate the residual by regressing dry matter intake on ADG and mid-test BW<sup>75</sup>. The six most efficient (RFI = -0.06±0.009) and six least efficient (RFI = 0.06±0.009) (P<0.0001) heifers were transported to Uvalde where grazing behavior was determined using digital jaw recorders to record and differentiate between jaw movements involved in grazing and ruminating. Recorders were placed on 2 high (inefficient) and 2 low (efficient) RFI heifers for 24 h, 4 different times over a 30-d period. All animals had 1–4 observation periods used in analysis. Grazing data were from 6-hr morning (5:30 to 11:30) and afternoon (14:30 to 20:30) periods. Differences in mean grazing time between high and low RFI animals for both activity times were analyzed using GLM procedures of SAS. During morning and afternoon activity periods no significant differences were seen in grazing behavior (P > 0.1). During the morning total time spent ruminating was 86.3±5.0 min for high RFI and 86.9±5.0 min for low RFI animals. High RFI animals spent less time grazing (98.3±10.8 min) than low RFI (106.0±10.8 min). High RFI animals took 30.3±1.9 bites/min while low RFI took 29.2±1.9 bites/min. High RFI animals spent more time idle (174.1±8.9 min) than low RFI (167.8±8.9 min). During the afternoon high RFI animals ruminated for 92.9±6.8 min and low RFI ruminated for 85.0±6.8 min. High RFI animals spent less time grazing (169.6±6.7 min) than low RFI (174.6±6.7 min). High RFI animals took 37.2±2.6 bites/min and low RFI animals took 32.9±1.7 bites/min. High RFI animals were idle for 27.1±1.6 min and low RFI were idle for 27.8±1.7 min. Variation in RFI in confinement feeding was not related to variation in subsequent grazing behavior.

**Key Words:** grazing, RFI, heifers

**83 Influence of residual feed intake on digestive kinetics in Brahman heifers.** R. O. Dittmar, III<sup>\*1</sup>, T. D. A. Forbes<sup>2</sup>, T. H. Welsh, Jr<sup>3</sup>, and R. D. Randel<sup>1</sup>, <sup>1</sup>Texas Agricultural Experiment Station, Overton, TX, <sup>2</sup>Texas Agricultural Experiment Station, Uvalde, TX, <sup>3</sup>Texas Agricultural Experiment Station, College Station, TX.

Digestive kinetics and their relationship with residual feed intake (RFI) were evaluated in 20-mo Brahman heifers (n=25) at Overton. Heifers were fed a pelleted 12% complete ration at 2.2% BW once daily in Calan gates for 77 d. Weekly BW were taken to adjust daily feed allocation and orts were weighed back. RFI was calculated using GLM procedures of SAS to calculate the residual by regressing dry matter intake on ADG and mid-test BW<sup>75</sup>. The most efficient (low RFI) (n=4) (RFI = -0.076±0.008) and least efficient (high RFI) (n=4) (RFI = 0.069±0.008) (P<0.0001) heifers were pulse-dosed with an ytterbium chloride digesta marker on d 77 to evaluate digestive kinetics. Low RFI animals produced 2.9±0.78 kg fecal DM/day and the high RFI produced 3.4±0.78 kg fecal DM/day (P > 0.1). Turnover of material in the rumen for low RFI animals was 18.8±3.92 g DM/day and 20.6±3.92

g DM/day for the high RFI animals (P > 0.1). Rumen residence time was 5.4±2.5 hr for low RFI animals and 7.0±2.5 hr for the high RFI animals (P > 0.1). The complete residence time for the system was 61.5±18.2 hr for low RFI and 78.7±18.2 hr for high RFI (P > 0.1). Gastro-intestinal residence time was 68.4±16.4 hr for low RFI animals and 84.1±16.4 hr for high RFI animals (P > 0.1). Although no significant differences were detected (possibly due to the small N) numerical differences indicate the possibility that more efficient animals produce less fecal dry matter per day, less rumen turnover, lower ruminal residence time, and lower gastro-intestinal residence time than the less efficient animals. The apparent increase in diet DMD in the more efficient animals supports earlier findings. These data support the need for further experiments relating residual feed intake with digestive kinetics.

**Key Words:** digestive kinetics, residual feed intake, heifers

**84 Relationships between residual feed intake and dry matter digestibility in growing calves.** W. K. Krueger<sup>\*1</sup>, G. E. Carstens<sup>1</sup>, P. A. Lancaster<sup>1</sup>, E. G. Brown<sup>1</sup>, L. J. Slay<sup>1</sup>, and T. D. A. Forbes<sup>2</sup>, <sup>1</sup>Texas A&M University, College Station, <sup>2</sup>Texas Agriculture Extension Service, Uvalde.

The objective of this study was to examine the relationship between residual feed intake (RFI) and dry matter digestibility (DMD) in growing calves. RFI is a moderately heritable feed efficiency trait that is independent of ADG and BW. In study 1 Santa Gertrudis steers (n = 120) were individually fed for 77 d on a high roughage diet (ME = 2.1 Mcal/kg). Individual DMI and BW were recorded and the RFI calculated as the residual of linear regression of DMI on ADG and mid-test BW<sup>75</sup>. Fifty-seven steers were randomly selected for collection of fecal samples for 10 d. Acid insoluble ash was used as an internal marker to estimate DMD. RFI was correlated (P < 0.001) with DMI (0.59) and DMD (-0.46). Low RFI steers (< 0.5 SD from the mean) consumed 18% less (P < 0.001) feed than high RFI steers (> 0.5 SD from the mean). Steers with low RFI had higher DMD (722 vs. 659 ± 14 g/kg; P < 0.01), than high RFI steers. In study 2, Brangus heifers (n = 114) were individually fed a high roughage diet for 70 d and individual DMI and BW were recorded. RFI was calculated and fecal samples collected for 10 d from the 20 lowest and 20 highest RFI heifers. RFI was correlated with DMI (0.68, P < 0.001) but not with DMD (P = 0.93). Heifers with low RFI consumed 19% less (P < .001) feed, but had similar DMD (739 and 746 ± 15 g/kg) compared to heifers with high RFI. Results from the first study suggested that calves with low RFI had higher DMD than high RFI calves; however, this finding was not confirmed in the second study.

**Key Words:** residual feed intake, dry matter digestibility, dry matter intake

**85 Use of fecal near-infrared reflectance spectroscopy to predict residual feed intake in growing calves.** H. Gutiérrez-Bañuelos<sup>\*1</sup>, S. Prince<sup>1</sup>, D. R. Tolleson<sup>1</sup>, G. E. Carstens<sup>1</sup>, T. D. A. Forbes<sup>3</sup>, F. M. Rouquette<sup>2</sup>, R. D. Randel<sup>2</sup>, and T. H. Welsh Jr<sup>1</sup>, <sup>1</sup>Texas A & M University, College Station, <sup>2</sup>Texas A & M University, Overton, <sup>3</sup>Texas A & M University, Uvalde.

The objective of this study was to evaluate the use of near-infrared reflectance spectroscopy (NIRS) analysis of feces to predict residual feed intake (RFI). Average daily gain and DMI were measured in three

studies with crossbred steers (N=166), Brangus heifers (N=229), and Santa Gertrudis steers (N=57) fed roughage-based diet (2.1 to 2.2 Mcal ME/kg). Spectra (408-1029 nm/1108-2429 nm) were obtained from fecal samples over one (study 1) or seven consecutive days (studies 2 and 3) from calves with the lowest (16%) and the highest (16%) RFI. Analysis 1 used the lowest and highest RFI calves (N=56) from study 1; analysis 2 used the lowest and highest RFI calves (N=76) from study 2. In these two analyses, NIRS prediction equations for RFI were developed using partial least squares (PLS) regression on 80% of the samples for calibration, withholding a random 20% for validation. Discrimination between low and high RFI calves was accomplished by 2-block PLS procedures. For analysis 3, predictive equations were developed using all calves from study 2, and validation conducted using the low and high RFI calves from study 3. Mahalanobis distance (H) of the NIRS fecal spectra were < 3.0 for all three studies (0.95, 1.29, and 0.82, respectively). These results suggest that fecal NIRS analysis has limited utility to accurately predict divergent RFI in growing bulls.

**Table 1. Predictive and discriminant equations using fecal NIRS to predict RFI**

Analysis	Predictive equations		Validation		Discriminant equations		Validation (% correct prediction)	
	R2	SECV	R2	SEP	R2	SECV	Low RFI	High RFI
1	0.70	1.11	0.28	1.44	0.71	0.54	83.3	33.3
2	0.65	0.75	0.59	0.98	0.48	0.41	61.5	46.2
3	0.71	0.69	0.31	0.89	0.68	0.46	9.1	100.0

SECV= Standard error cross validation SEP= Standard error of prediction

**Key Words:** cattle, feed efficiency, NIRS

**86 Performance and economic assessment of two management systems for spring-born calves.** S. J. Winterholler\*, M. D. Hudson, G. W. Horn, C. R. Krehbiel, and D. L. Lalman, *Oklahoma State University, Stillwater.*

Calf-fed steers (n=84) and yearling steers (n=60) were utilized in a two-year study that evaluated performance, carcass traits and economics of calf-fed and yearling management systems. At weaning, steers of predominantly Angus genetics and similar age were either sent directly to feedlot (calf-fed) or grazed wheat pasture for 164 d prior to feedlot entry (yearling). Initial feedlot weight was 222 and 445 kg among calf-fed and yearling steers, respectively; all steers were fed to similar back fat endpoints as determined by visual evaluation. Yearling steers were 103 kg heavier at harvest, had greater average daily gain (1.84 vs 1.66 kg) and greater average daily feed intake during the finishing phase (12.42 vs 8.94 kg), but poorer gain:feed than calf-fed steers (P<0.01). Hot carcass weight was 68.5 kg greater for yearling steers, dressing percentage was increased, and ribeye area was larger compared to calf-fed steers (P<0.01). There was no difference in 12th rib fat, % KPH, yield grade, or overall marbling score (P>0.10). Live animal economic analysis based on 5 yr average prices and production costs demonstrated greater cost of feedlot gain (P=0.07) for yearling steers but no difference in finishing phase profitability among calf-fed (\$-21.46) and yearling steers(\$-56.30) (P>0.10). Average

grazing phase profit in the yearling system was \$14.05. Breakeven selling price was higher (P=0.06) for steers in the calf-fed system (\$82.10) compared to steers in the yearling system (\$77.71). There was no difference in profitability (P>0.10) for steers in the calf-fed system (\$-21.46) compared to steers in the yearling system (\$-42.25). Our results indicated that a yearling beef production system incorporating long-term winter wheat grazing resulted in a 22% increase in hot carcass weight with little impact on carcass quality.

**Key Words:** economics, steers, systems

**87 Application of real-time ultrasound for predicting carcass attributes in feedlot steers.** T. L. Perkins\* and A. Rimal, *Missouri State University, Springfield.*

The ability to evaluate carcass traits in beef cattle is necessary to produce cattle that yield consistent meat products of desirable quality. The objectives of the study were to: 1) determine harvest endpoints of feedlot cattle; 2) determine the accuracy of ultrasound; and 3) to improve the predictive power of the current feedlot sorting model. Carcass characteristics were collected on 205 feedlot steers harvested in 1999, 160 feedlot steers harvested in 2000 and 157 feedlot steers harvested in 2001. The following traits were included in the study: average daily gain (ADG), fat thickness (FT), ribeye area (REA), quality grade (QG), yield grade (YG), dressing percent (DP), percent kidney, pelvic, heart fat (%KPH) and harvest weight (HWT), and carcass weight (HCW). The steers were measured for fat thickness (FTU), ribeye area (REAU), and intramuscular fat (%FATU) using an Aloka 500 V, Micrus ultrasound unit. Ribomatic Software from Critical Vision, Inc. (Atlanta, Georgia) was used to determine FTU and PFU from the images collected via ultrasound. The ultrasound data was used to predict the final carcass endpoints for harvest weight (HWTP), quality grade (%FATUP) and fat thickness (FTUP). The correlations for FTUP and FT, FTU and FT, %FATUP and QG, %FATU and QG, and HWTP and HWT are 0.59, 0.52, 0.28, 0.27, and 0.80, respectively. The correlations for FTUP and FT were higher when ultrasound data was taken 95 days prior to harvest as apposed to 21 days, 56 days and 103 days, respectively. The correlations for %FATUP and QG were higher when ultrasound data was taken 103 days (0.33) prior to harvest as apposed to 21 days (0.07), 56 days (0.32) and 95 days (0.29), respectively. This data suggests that the current feedlot sorting model could be improved, which would lead to more uniform carcasses at harvest. This would increase the value of the carcasses and increase profits to producers.

**Key Words:** ultrasound, steers, beef

**88 Relationship of lactate dehydrogenase activity to body measurements of Angus × Charolais cows and calves.** M. L. Looper\*<sup>1</sup>, T. P. Neidecker<sup>2</sup>, C. W. Wall<sup>3</sup>, S. T. Reiter<sup>4</sup>, R. Flores<sup>4</sup>, A. H. Brown, Jr.<sup>4</sup>, Z. B. Johnson<sup>4</sup>, and C. F. Rosenkrans, Jr.<sup>4</sup>, <sup>1</sup>USDA-ARS, Dale Bumpers Small Farms Research Center, Booneville, AR, <sup>2</sup>Neidecker Farms, Van Buren, AR, <sup>3</sup>University of Arkansas Cooperative Extension Service, Van Buren, <sup>4</sup>University of Arkansas, Fayetteville.

Objectives were to examine 1) relationships between lactate dehydrogenase (LDH) activity and body measurements of grazing beef

cows, and 2) the association between maternal LDH activity in late gestation and subsequent calf birth weight (BRW), hip height (HH) at weaning, and adjusted weaning weight (WW). At 60 d prepartum (mean calving date = Jan 29), BW, BCS, and cow HH (CHH) were recorded, and longissimus muscle area (LMA), intramuscular fat percentage (IMF), and rib fat (RF) were measured via ultrasonography from Angus × Charolais cows (n = 88; mean age = 5.1 ± 2.6 y). A blood serum sample was collected from each cow and concentrations of LDH activity were determined and ranked (mean ± 1 SD) into three categories. Measurements were grouped into two sets: set 1 was cow traits and included forward and reverse LDH, LMA, IMF, and RF, and set 2 was calf traits and included HH and WW. Prepartum LDH activity was not correlated (P > 0.10) with any cow measurements with the exception of cow BCS and forward LDH activity (r = 0.21; P = 0.09). Prepartum LDH activity was not related (P > 0.10) to sex or BRW of calves. Cows with low reverse LDH activity had calves with increased (P < 0.05) HH and WW compared with cows with high LDH activity. Reverse LDH activity was inversely correlated with HH (r = -0.28; P = 0.01) and WW (r = -0.21; P = 0.05) of calves. Cow LMA was correlated (P < 0.05) with BW (r = 0.37), BCS (r = 0.39), and CHH (r = 0.25), and with WW of calves (r = 0.28; P = 0.01). First canonical correlation between cow forward and reverse LDH activity, and calf HH and WW tended to be significant (r = 0.30; P = 0.08). Further, the first canonical correlation between the set of cow traits including LMA, IMF, and RF was correlated (r = 0.36; P = 0.02) with calf WW and HH. A linear combination of cow LMA and reverse LDH activity were correlated (P < 0.01) to a linear combination of calf WW and HH (r = 0.38). Decreased reverse LDH activity in prepartum cows was associated with taller and heavier calves at weaning; increased weaning weights will enhance profitability of cow-calf operations.

**Key Words:** beef cows, lactate dehydrogenase, weaning weight

**89 Relationships between temperament traits and feed efficiency in growing bulls.** B. M. Bourg\*<sup>1</sup>, G. E. Carstens<sup>1</sup>, Z. Paddock<sup>1</sup>, L. O. Tedeschi<sup>1</sup>, and W. Maffei<sup>2</sup>, <sup>1</sup>Texas A&M University, College Station, <sup>2</sup>Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil.

Development of objective measurements of temperament will facilitate selection of docile cattle. The objective of this study was to compare two objective measures of temperament (EV, Exit Velocity; EB, Escape Behavior) with a subjective measure of temperament (Chute Score=CS; 1 = quiet, 5 = excited), and to examine their relationships with growth and feed efficiency traits in growing bulls (initial BW=340 ± 54 kg). Fifty-three bulls (25 Brahman, 13 Angus, 15 Brangus) were used in this study. Exit Velocity was measured as the rate of distance traveled (m/s) while exiting from a confined area. Escape Behavior was determined by measurements of frequency and intensity of movements using a tri-axial accelerometer for 15 s while the animal was unrestrained in a chute. Growth and DMI were measured over an 84-d period at a commercial test facility equipped with a GrowSafe® feeding system. Exit Velocity, CS, and EB were determined on d 0. Residual feed intake (RFI) was calculated as the residual from the linear regression of DMI on mid-test BW<sup>0.75</sup> and ADG. EV tended to be correlated (P < 0.10) with ADG (-0.26), DMI (-0.24), and IBW (-0.23). EV also tended to be correlated with FCR (-0.24; P < 0.10), but not with RFI. CS tended to be correlated (P < 0.10) with RFI (0.25), but not with other performance or efficiency traits. Phenotypic

correlations between temperament and performance traits differed across breeds. For Brangus, EV, EB, and CS tended to be correlated (P < 0.10) with ADG (-0.49; -0.72; -0.74 respectively). In addition, EB tended to be correlated (P = 0.10) with DMI (-0.44) and FCR (-0.44). For Brahman, EV was correlated (P < 0.10) with ADG (-0.39), but was not correlated with DMI. There were no phenotypic correlations between temperament and efficiency traits in Angus. This preliminary analysis suggests that EB and EV may be useful objective measurements of temperament, but more research is needed.

**Key Words:** temperament, beef cattle, feed efficiency

**90 Energy requirements for maintenance and growth of purebred and crossbred *Bos indicus*: A meta-analysis evaluation.** M. L. Chizzotti\*<sup>1,2</sup>, L. O. Tedeschi<sup>2</sup>, S. C. Valadares Filho<sup>1</sup>, P. V. R. Paulino<sup>1</sup>, F. H. M. Chizzotti<sup>1,2</sup>, and G. E. Carstens<sup>2</sup>, <sup>1</sup>Universidade Federal de Viçosa, Brazil, <sup>2</sup>Texas A&M University, College Station.

A meta-analysis was conducted to evaluate the NE requirements of growing bulls, steers, and heifers of Nellore purebred, Nellore × *Bos taurus* crossbreds, and dairy *Bos indicus* purebred and crossbreds. A database of 17 comparative slaughter studies (n = 433 animals) conducted in the tropics (Brazil) was gathered. The data provided enough information to compute ME intake, BW, and empty body gain (EBG) to develop equations to predict NE<sub>m</sub> and NE<sub>g</sub>. The data were analyzed using a random coefficients model, considering studies as random effects and the fixed effects of gender (bulls, steers, and heifers; n = 284, 115 and 34, respectively) and breeds. Breeds included in the database were Nellore (n = 271), F1 Nellore crossbreds with Angus, Red Angus, Simmental, and Limousin (n = 118), and dairy *Bos indicus* purebred and crossbreds, including Gir, Guzerah, Holslein × Gir, and Holslein × Guzerah (n = 44). Either unstructured or variance components variance-covariance matrix was used. There were no differences in NE<sub>m</sub> requirements among genders (P = 0.99) and breeds (P = 0.19). The combined data indicated a NE<sub>m</sub> requirement of 74.7 kcal/kg<sup>0.75</sup> of EBW with a partial efficiency of use of ME to NE<sub>m</sub> of 67%. There were no differences in NE<sub>g</sub> requirement among breeds (P = 0.07). The NE<sub>g</sub> requirement for steers and heifers were similar (P = 0.20), but were higher (P < 0.001) than that for bulls. The equation for steers was NE<sub>g</sub> = 0.0706 × BW<sup>0.75</sup> × EBG<sup>1.057</sup>, for heifers it was NE<sub>g</sub> = 0.0823 × BW<sup>0.75</sup> × EBG<sup>1.057</sup>, and for bulls it was NE<sub>g</sub> = 0.0508 × BW<sup>0.75</sup> × EBG<sup>1.057</sup>. The partial efficiency of use of ME to NE<sub>g</sub> was not different among genders (P = 0.41) and breeds (P = 0.17), and averaged 0.42. Our results did not support the hypothesis that bulls have greater NE<sub>m</sub> requirements than steers and heifers. Nonetheless, our results indicated that NE<sub>g</sub> for bulls might be lesser than those for steers and heifers.

† Author thanks CAPES (Brazil) for providing the financial support.

**Key Words:** Nellore, comparative slaughter, net energy

**91 Protein requirements for maintenance and growth of purebred and crossbred *Bos indicus*: A meta-analysis evaluation.** M. L. Chizzotti\*<sup>1,2</sup>, L. O. Tedeschi<sup>2</sup>, S. C. Valadares Filho<sup>1</sup>, P. D. B. Benedeti<sup>1</sup>, P. M. Amaral<sup>1</sup>, and T. I. Rodrigues<sup>1</sup>, <sup>1</sup>Universidade Federal de Viçosa, Brazil, <sup>2</sup>Texas A&M University, College Station.

A meta-analysis was performed to obtain the net protein (NP) requirements of growing bulls, steers, and heifers of Nellore purebred,



Nellore  $\times$  *Bos taurus* crossbreds, and dairy *Bos indicus* purebred and crossbreds. A database of 16 comparative slaughter studies ( $n = 357$  animals) conducted in the tropics (Brazil) was built. The data provided sufficient information of N intake, empty body gain (EBG, kg/d), and retained energy (RE, Mcal/d) and protein to develop equations to predict NP for maintenance ( $NP_m$ ) and growth ( $NP_g$ ). The data were analyzed using a random coefficients model, considering studies as random effects and the fixed effects of gender (bulls, steers, and heifers;  $n = 230, 85,$  and  $24,$  respectively) and breeds (Nellore, F1 Nellore crossbreds with Angus, Red Angus, Simmental and Limousin, and dairy *Bos indicus* purebred and crossbreds, including Gir, Guzerah, Hosltein  $\times$  Gir, and Hosltein  $\times$  Guzerah;  $n = 209, 104,$  and  $26,$  respectively). Either unstructured or variance components variance-covariance matrix was used. There were no differences in  $NP_m$  requirement among genders ( $P = 0.59$ ) and breeds ( $P = 0.92$ ). The overall data indicated an  $NP_m$  requirement of  $1.74$  g of NP/kg  $EBW^{0.75}/d$ . Assuming an efficiency of use of MP to  $NP_m$  of  $0.67$ , the overall MP requirement for maintenance was  $2.59$  g of MP/kg  $EBW^{0.75}/d$ . The  $NP_g$  was not different among genders ( $P > 0.77$ ) and breeds ( $P > 0.09$ ); the overall equation was  $NP_g$  (g/d) =  $EBG \times (220 - 13.8 \times RE/EBG)$ . The percentage of RE deposited as protein ( $RE_p$ ) decreased exponentially as content of RE in the gain ( $RE_c$ , Mcal/kg EBG) increased. Because no study effect was observed, we pooled the data across studies and the overall equation was  $RE_p = 0.1027 + 1.7015 \times e^{(-0.6689 \times RE_c)}$ . Our results indicated no differences in the  $NP_m$  among bulls, steers, and heifers. Similarly, even though the  $RE_p$  was negatively correlated with the concentration of energy in the EBG, our findings indicated no differences in  $NP_g$  for bulls, steers, and heifers.

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**Key Words:** Nellore, comparative slaughter, net protein

**92 Meta-analysis of the effects of dietary urea levels on performance, digestibility, and N metabolism in crossbred steers.** F. H. M. Chizzotti<sup>1,2</sup>, M. L. Chizzotti<sup>\*1,2</sup>, L. O. Tedeschi<sup>2</sup>, O. G. Pereira<sup>1</sup>, and S. C. Valadares Filho<sup>1</sup>, <sup>1</sup>Universidade Federal de Viçosa, Brazil, <sup>2</sup>Texas A&M University, College Station.

A database of 9 studies ( $n = 227$  animals) conducted in Brazil was compiled to evaluate the effects of dietary urea levels (ranging from 0 to 2.26% of DM) on animal performance, intake and digestibility of DM, OM, CP, NDF, non-fiber carbohydrates (NFC), and ether extract (EE). The diets were designed to contain finely ground corn, mineral salt, and soybean meal or cottonseed meal replaced with urea. The data were analyzed using a random coefficients model, considering studies as random effects and either unstructured or variance components variance-covariance matrix. Urea levels (% DM) had no effects on intake of nutrients (DM, OM, CP, NDF, NFC, and EE;  $P > 0.34$ ). As expected, the CP digestibility was positively correlated ( $P < 0.001$ ) with urea levels. Nonetheless, the digestibility of other nutrients (DM,

OM, NDF, NFC, and EE) were not affected ( $P > 0.11$ ) by levels of dietary urea. Similarly, ADG was not influenced by urea levels ( $P = 0.18$ ) and averaged  $1.23$  kg/d. In the same fashion, feed efficiency and dressing percentage were not affected ( $P = 0.38$  and  $P = 0.92$ , respectively) by levels of dietary urea. Our analysis suggested that even at high levels of dietary urea (2.26% DM), crossbred steers showed no urea toxicity and maintained their growth performance. However, the recommended level of dietary urea might depend on the digestibility of the OM and growth rate. The optimum level of dietary urea to reduce costs and maximize animal performance may not match those required to minimize N excretion into the environment.

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**Key Words:** non-protein nitrogen, protein supplementation

**93 Factors affecting milk yield and milk fat of dairy farms located in the central region of Thailand.** J. A. Rhone<sup>\*1</sup>, S. Koonawootrittriron<sup>2</sup>, and M. A. Elzo<sup>1</sup>, <sup>1</sup>University of Florida, Gainesville, <sup>2</sup>Kasetsart University, Bangkok, Thailand.

The objectives of the study were to determine the effects of year-season, farm location, and farm size on milk yield per farm (MYF), milk fat per farm (MFF), and average milk yield per cow (MYC). Collection of data was at the farm level; individual animal records were unavailable. There were a total of 967,110 MYF and 58,575 MFF records from 1,034 farms. Traits were analyzed using single-trait mixed models. Fixed effects were: 1) year-season, where year = 2003 to 2006, and season = winter (November to February), summer (March to June), and rainy (July to October), 2) farm size (number of cows per farm for MYF, and small:  $< 10$  cows; medium: 10 to 19 cows; and large:  $> 20$  cows, for MFF and MYC), and 3) farm locations (4 districts: Kaeng Koi, Muaklek, Pakchong, and Wang Muang). Random effects were farm and residual effects. Farm effects were assumed to be uncorrelated. Important effects were year-season by farm district interaction for MYF, farm size by farm district interaction and year-season for MYC ( $P < 0.001$ ), and year-season for MFF ( $P < 0.001$ ). Farm size by farm district interaction approached significance for MFF ( $P = 0.07$ ). Except for Wang Muang, MYF was lower during the rainy season within year and district ( $P < 0.05$ ) than in the summer and winter seasons. In Muaklek and Pakchong, small size farms had higher MYC ( $P < 0.05$ ) than both medium and large size farms. In Kaeng Koi and Wang Muang, MYC was similar among farm sizes. Small size farms in Muaklek had higher MFF than medium and large size farms ( $P < 0.05$ ), while farms in all other districts showed no significant differences. In conclusion, most small size farms had higher MYC and MFF than medium and large size farms, and the rainy season had a negative impact on MYF and MYC across farm districts.

**Key Words:** milk fat, milk yield, Thailand

## Small Ruminant Production

**94 Interaction between high protein supplement and copper oxide wire particles to control gastrointestinal nematodes in growing goats.** J. M. Burke<sup>\*1</sup>, J. E. Miller<sup>2</sup>, and T. H. Terrill<sup>3</sup>, <sup>1</sup>USDA, Agricultural Research Service, Booneville, AR, <sup>2</sup>Louisiana State University, Baton Rouge, <sup>3</sup>Fort Valley State University, Fort Valley, GA.

The objective was to investigate the interaction between high protein supplementation and copper oxide wire particles (COWP) to control gastrointestinal nematodes (GIN) in growing female goats. *Haemonchus contortus* is the primary GIN during summer months on this farm. In early August 2006, Boer and Spanish × Boer does (193 ± 2 days of age) were assigned randomly in a 2 × 2 factorial design to receive no or 2 g COWP and were supplemented with 220 g corn/SBM (CSB; 14% CP; 9 untreated and 8 COWP-treated does/supplement) or cottonseed meal (CSM; 41% CP; 8 untreated and 9 COWP-treated does/supplement) while grazing two bermudagrass pastures at a stocking rate of 14 does/ha. To minimize differences in forage quality between pastures does were rotated between the two pastures every 7 days. Supplement was withdrawn on day 42 (day 0 = day of first COWP administration). A second 2 g bolus of COWP was administered to all kids on Day 42 to assess value as an anthelmintic in does administered no or 2 g COWP previously. Body weight was determined every 28 days and feces and blood collected every 7 days for fecal egg counts (FEC) and blood packed cell volume (PCV) analyses. There was a marked reduction in FEC in COWP-treated goats within 7 days, which remained lower than in untreated does until Day 21 in CSB does and Day 28 in CSM does (COWP × day,  $P < 0.001$ ; supplement × day,  $P < 0.08$ ). PCV tended to increase in COWP-treated compared with untreated does ( $P < 0.08$ ). All goats responded similarly to COWP administered on Day 42 with a 79% reduction in FEC from previous week. FEC of Spanish × Boer crossbred goats were lower (834 ± 198 vs. 1437 ± 269 eggs/g;  $P < 0.04$ ) and PCV higher (27.0 ± 0.3 < 25.1 ± 0.4%;  $P < 0.002$ ) compared with Boer goats. Body weight was similar among treatment groups throughout experiment (Day 0: 21.2 ± 0.5 kg; Day 49: 28.8 ± 0.5 kg). There was no advantage to supplementation with CSM compared with CSB for reduction of GIN. COWP was effective in control of existing GIN infection in both supplementation groups.

**Key Words:** copper oxide, goats, parasites

**95 Low dose titration of copper oxide wire particles for control of gastrointestinal nematodes in weaned kids.** J. M. Burke<sup>\*1</sup>, J. E. Miller<sup>2</sup>, and T. H. Terrill<sup>3</sup>, <sup>1</sup>USDA, Agricultural Research Service, Booneville, AR, <sup>2</sup>Louisiana State University, Baton Rouge, <sup>3</sup>Fort Valley State University, Fort Valley, GA.

The objective was to determine whether a low dose of copper oxide wire particles (COWP) would be as effective as a higher dose in reducing gastrointestinal nematode (GIN) infection. In May 2006, 40 Boer × Spanish doe and wether kids naturally infected with GIN were weaned (97 ± 2 days of age) and assigned randomly to receive 0, 0.5, 1, 2, and 4 g COWP (n = 8/treatment; day 0). Kids grazed bermudagrass pasture (33 kids/ha) and were supplemented with 220 g corn/soybean meal (14% CP, DM basis)/kid daily. Body weight was determined at 0 and 28 days after COWP administration and feces and blood were collected every 7 days for FEC and PCV determination. Kids were

dewormed if PCV was below 20%. *Haemonchus contortus* is typically the predominant GIN during summer months on this farm. On Day 0 FEC ranged between 440 (0.5 g group) and 2050 eggs/g (1 g group), but log transformed means were not different among groups on that day. FEC were similar among all doses of COWP for all dates ( $P > 0.10$ ). When COWP-treated groups were pooled, FEC were lower (COWP × date,  $P < 0.05$ ) on Days 7 ( $P < 0.002$ ), 14 ( $P < 0.004$ ), and 21 ( $P < 0.05$ ) compared with untreated kids, but similar by Day 28. PCV was similar between untreated and COWP-treated kids on Days 0 and 7, but lower in untreated kids by Day 14 (COWP × date,  $P < 0.05$ ). Because PCV dropped below 20%, nearly one third of all kids were dewormed on Day 21 and 88% were dewormed by Day 28, independent of COWP treatment. Therefore, COWP does not appear to be effective in controlling newly acquired L4 larvae which also feed on blood, leading to decreased PCV. Average daily gain tended to increase with dose of COWP up to 2 g then decreased at 4 g ( $P < 0.07$ ). Body weights on Day 0 were 15.3, 14.7, 13.8, 15.5, 14.4 ± 0.9 kg and on Day 28 were 18.4, 18.7, 17.3, 19.7, 17.8 ± 0.9 kg for kids administered 0, 0.5, 1, 2 and 4 g COWP (COWP × date,  $P < 0.07$ ). A dose as low as 0.5 g was effective in reducing FEC, but because the amount of larvae on pasture was likely very high, additional treatment was necessary within 4 weeks.

**Key Words:** copper oxide, goats, parasites

**96 Interaction between copper oxide wire particles and grazing sericea lespedeza to control gastrointestinal nematodes in goats.** J. M. Burke<sup>\*1</sup>, J. E. Miller<sup>2</sup>, T. H. Terrill<sup>3</sup>, and J. Mosjidis<sup>4</sup>, <sup>1</sup>USDA, Agricultural Research Service, Booneville, AR, <sup>2</sup>Louisiana State University, Baton Rouge, <sup>3</sup>Fort Valley State University, Fort Valley, GA, <sup>4</sup>Auburn University, Auburn, AL.

Because complete dewormer resistance is no longer uncommon, finding alternative means to control gastrointestinal nematodes (GIN) is imperative. The objective was to investigate the interaction between grazing sericea lespedeza (SL) and use of copper oxide wire particles (COWP) to control GIN, where the primary species was *Haemonchus contortus*. In mid-June yearling Boer does that weighed 35 ± 2 kg were assigned randomly in a 2 × 2 factorial design to receive no or 5 g COWP and grazed tall fescue (TF; 4 untreated and 6 COWP-treated does/forage) or SL (6 untreated and 4 COWP-treated does/forage) at a stocking rate of 10 does/0.4 ha. Does were offered free choice trace mineralized salt and water. Does grazed respective pastures for 21 d then were all returned to tall fescue. Feces and blood were collected every 7 d for 28 d for fecal egg count (FEC) and blood packed cell volume (PCV) analyses. Mature does administered 5 g COWP that grazed SL benefited from both GIN control measures with the lowest FEC between Days 7 and 28, though the interaction was not significant, and the highest PCV by Day 21 compared with other groups (COWP × forage × day,  $P < 0.02$ ). COWP decreased FEC in both TF and SL grazing goats within 7 d of treatment, but means began to increase by Day 28 (COWP × day,  $P < 0.02$ ). In addition, FEC from the SL goats tended to be lower than the TF goats ( $P < 0.07$ ), but then increased after withdrawal from SL pasture. None of the COWP-treated does required deworming by Day 28, but 54 ± 11.6% of untreated does required deworming by this time ( $P < 0.005$ ). A combination of COWP and SL appears to be beneficial for GIN management in goats.

**Key Words:** copper oxide, goats, sericea lespedeza

**97 Field applications of liquid nitrogen fertilizer for controlling gastrointestinal parasites in weanling meat goats.** J.-M. Luginbuhl\* and H. M. Glennon, *North Carolina State University, Raleigh.*

A field study was conducted to determine the effectiveness of field application of liquid nitrogen fertilizer (LNF) to suppress fecal egg count (FEC; no. eggs/g feces) in weanling meat goat wethers grazing bermudagrass pastures. Seventy-six adult does (avg initial FEC: 1790) were grazed on the experimental field 5–16 June for contamination with trichostrongyle eggs. The field was flail-chopped on 19 June and divided into 8 plots in a RCBD with 4 field replications. Plots received either LNF (56 kg N/ha) or granular urea (50 kg N/ha) on 30 June. Forty wether kids were drenched with moxidectin (0.5 mg/kg BW) and levamisole hydrochloride (11 mg/kg BW) 9 d prior to the start of grazing on study plots (5 July). Wether kids were then stratified by initial FEC (avg: 26; range: 0 to 100) and BW (avg: 21 kg; range: 17 to 29 kg), placed into subgroups with similar BW and FEC, and randomly assigned within subgroups to 1 of 8 plots (400 m<sup>2</sup>). Wether kids were control-grazed on either LNF or urea-treated plots for 33 d. Each plot was divided into 4 equal sections and goats were moved into a new section every 2 to 5 d depending on forage availability (avg: 2524 kg DM/ha). FAMACHA<sup>®</sup> mucous eye membrane scores, and fecal and blood samples were taken on d 0, 7, 14, 21, and 28. FAMACHA<sup>®</sup> scores (avg: 1.6, 1.8, 1.8, 2.1, 3.2), packed cell volume (avg: 30.7, 31.0, 28.0, 21.7, 18.9) and FEC (26, 64, 702, 861, 2541) were similar between treatments on each sampling date but over time showed trends associated with higher worm loads. *Haemonchus* and *Trichostrongylus* larvae (no./100 g forage DM) harvested from study plots on 13 July averaged, respectively, 2005 and 498 on granular urea and 945 and 184 on LNF-treated plots. The study was ended on d 33 when the majority of goats started to develop intermandibular edema resulting from hypoproteinemia. Under the conditions of this study, LNF was not effective in reducing goat worm loads, contrary to results from a similar study conducted on tall fescue pastures.

**Key Words:** gastrointestinal parasites, meat goats, liquid nitrogen fertilizer

**98 Influence of high tannin grain sorghum on gastrointestinal nematode infection (GIN) in goats.** N. C. Whitley\*<sup>1</sup>, J. E. Miller<sup>2</sup>, J. M. Burke<sup>3</sup>, D. Cazac<sup>1</sup>, R. Subburathinam<sup>1</sup>, and L. Dykes<sup>4</sup>, <sup>1</sup>*University of Maryland Eastern Shore, Princess Anne, MD*, <sup>2</sup>*Louisiana State University, Baton Rouge*, <sup>3</sup>*USDA-ARS-DBSFR, Booneville, AR*, <sup>4</sup>*Texas A&M University, College Station.*

Previous studies have demonstrated that condensed tannin-rich forages such as sericea lespedeza can control GIN in goats, therefore the objective of three experiments (EXP) was to determine the influence of high tannin grain sorghum on GIN in goats. Naturally infected Boer crossbred animals were used with 16 mixed sex goats at 124 ± 2.9 days of age in EXP 1, 24 mixed sex goats at 160 ± 3.6 days of age in EXP 2 and 22 male goats at 259 ± 3.0 days of age in EXP 3. Animals were removed from pasture and placed on concrete slatted (EXP1) or expanded metal flooring (EXP 2 and 3) at d-7 (EXP 1 and 3) or d-28 (EXP 2; d0=first day of sorghum feeding). Goats were fed diets containing high or low tannin grain sorghum (equal numbers of goats per treatment). Packed cell volume (PCV; sera/packed red blood cells\*100%), FEC and FAMACHA<sup>®</sup> eyelid color scores (EYE; 1 to

5 with 1 = red and 5 = white; EXP 1 only) were recorded on d0 and then every 7 d for 21 d (14 d for EXP 3). Animals were treated with an anthelmintic when PCV dropped below 20%. For EXP 1, percentage of animals dewormed, FEC, PCV and EYE were not influenced by treatment and averaged 13.6 ± 4.5%, 620 ± 139 eggs per gram (epg), 23.1 ± 0.7% and 3.2 ± 0.12, respectively for all animals. As expected, EYE and PCV were negatively related ( $r = -0.45$ ;  $P < 0.001$ ). For EXP 2, there was no influence of treatment on PCV (28.8 ± 0.5%) or FEC, however, there was an effect of day ( $P < 0.001$ ) in which all animals had higher FEC on d0 (1956 ± 219 epg) than any other sampling day. In EXP 3, again, there was no effect of treatment on FEC (2992 ± 591 epg) or PCV (25.1 ± 0.5%). Although high tannin forages such as sericea lespedeza have been found to reduce FEC in small ruminants, in the present studies, high tannin grain sorghum (which may contain a different type of tannin than sericea) did not influence FEC or PCV in goats.

**Key Words:** goat parasite, tannin, FEC

**99 Effect of vaccination of goats with H-11/H-gal-GP antigens from intestinal membrane cells of *Haemonchus contortus*.** D. D. Olcott<sup>1</sup>, B. M. Weeks<sup>1</sup>, K. Shakya<sup>1</sup>, W. D. Smith<sup>2</sup>, and J. E. Miller\*<sup>1</sup>, <sup>1</sup>*Louisiana State University, Baton Rouge*, <sup>2</sup>*Moredun Research Institute, Edinburgh, Scotland, UK.*

Vaccination of sheep with H-11/H-gal-GP antigens has been effective in reducing *Haemonchus contortus* infection in sheep. These antigens have not been tested in goats. Antigens were purified from the intestinal membrane cells of adult worms and combined with Quil A (adjuvant). Twenty-two crossbred goats were dewormed to remove existing infections and randomly assigned to 2 concrete floor pens (n=11 each). The vaccinate group received the antigens 35, 21 and 7 d prior to Day 0 and the control group received just Quil A. On Day 0, all animals were experimentally infected with 5000 *H. contortus* L3. Infection was monitored by fecal egg count (FEC) and blood packed cell volume (PCV) over a 70 d period. Immune response to the antigens was monitored by serum IgG levels. Overall mean FEC and PCV were significantly ( $P < 0.05$ ) lower and higher, respectively, in the vaccinated group compared to the control group from Day 21 post infection to the end of the study. The IgG levels peaked 21 d after the first vaccination and remained high throughout the remaining booster series, but began to wane after infection. However, the IgG levels remained significantly ( $P < 0.05$ ) higher throughout the entire study. A third booster vaccination, given on Day 49, caused a sharp increase in IgG levels and a 96% reduction in FEC. Due to impending clinical haemonchosis, the three animals in each group with the highest FEC were necropsied on Day 56. The remaining animals were necropsied on Day 70. On the 2 necropsy days, respectively, there were 20% ( $P > 0.05$ ) and 96% ( $P < 0.05$ ) fewer *H. contortus* adults recovered from the vaccinated group. Results of this study indicated that H11/H-gal-GP vaccination prior to infection reduced FEC, but had limited effect on worm burden; and, subsequent to a booster vaccination during the established infection, worms were essentially eliminated. H11/H-gal-GP antigens show promise for controlling pasture contamination and *H. contortus* infection in goats.

**Key Words:** goat, nematodes, vaccine

**100 Fecal egg counts and packed blood cell volume in periparturient Katahdin and St. Croix hair sheep ewes grazing naturally parasite-infected pasture.** S. Wildeus\*<sup>1</sup> and A. M. Zajac<sup>2</sup>, <sup>1</sup>Virginia State University, Petersburg, <sup>2</sup>Virginia-Maryland College of Veterinary Medicine, Blacksburg, VA.

Periparturient ewes experience a depression in immunity that can be associated with an increased susceptibility to gastrointestinal nematode infection. This experiment evaluated the periparturient rise in fecal egg counts (FEC) in the St. Croix and Katahdin hair sheep with reputed breed difference in resistance to nematode parasitism. Ewes (n=13/breed) were mated in December and moved from drylot to a naturally parasite-infected pasture on March 15. Ewes lambled on pasture during a 12 d period starting April 24. Fecal egg counts, packed blood cell volume (PCV) and anemia scores (FAMACHA) were determined in 7 d intervals for 7 wk starting April 19. Data were analyzed in a model with breed and day of sampling as main effects. Fecal egg counts were analyzed statistically after log conversion, but are reported as arithmetic means. Litter size and litter birth weight were not different (P>0.1) between the two breeds (Katahdin: 1.61 lambs and 7.18 kg; St. Croix: 1.92 lambs and 5.95 kg, respectively), and there were also no differences between Katahdin and St. Croix ewes in FEC, PCV or FAMACHA score. There was evidence of a periparturient rise as FEC rose significantly (P<0.05) from 226-243 eggs/g before lambing to peak at 1250 eggs/g 2 wk after onset of lambing, followed by a gradual decline to pre-lambing levels within 6 wk after the onset of lambing. In contrast, PCV linearly decreased (P<0.05) from 33.6% prior to lambing to 29.6% at the end of sampling. The change in PCV was also reflected in an increase (P<0.05) in FAMACHA score from 1.85 to 2.35 during this period. No correlation between FEC and PCV was observed in these periparturient ewes. Results indicate the presence of a modest periparturient rise in FEC in hair sheep, but also suggest no advantage in the St. Croix in parasite resistance under moderate levels of infection.

**Key Words:** hair sheep, nematode parasite, periparturient rise

**101 Pasture-raised Katahdin and Katahdin crossbred lambs: growth and parasite resistance.** N. C. Whitley\*<sup>1</sup>, D. J. Jackson<sup>1</sup>, D. Cazac<sup>1</sup>, J. E. Miller<sup>2</sup>, J. M. Burke<sup>3</sup>, and S. Schoenian<sup>4</sup>, <sup>1</sup>University of Maryland Eastern Shore, Princess Anne, MD, <sup>2</sup>Louisiana State University, Baton Rouge, <sup>3</sup>USDA-ARS-DBSFRC, Booneville, AR, <sup>4</sup>MCE-WMREC, Keedysville, MD.

Katahdin ewes were mated to Dorper, Texel, Suffolk or Katahdin rams (3 ram/breed; 8–10 ewes per ram) to compare growth performance and parasite resistance of the lambs. Lamb BW was measured at birth (=d0), and then every 30d to d210. Fecal egg counts (FEC) were determined at d90 and 120. Packed cell volume (PCV; sera/packed red blood cellsx100%) was measured every 30d from d90–210 to determine need for anthelmintic treatment. Lambs were dewormed on d90 (weaning) and if PCV<20%. There were 2.4±0.1 lambs born/ewe lambing at 4.0±0.2 kg BW each with no effect of sire. Lamb BW, ADG and FEC were influenced by a breed x day interaction (P<0.01). At d30, Suffolk–(SK) sired lambs were heavier (P<0.02) than Katahdin (KA) lambs while Dorper–(DK) and Texel–sired (TK) lambs were

intermediate. At d60, BW for SK and DK>KA and SK>TK lambs (P < 0.01) and, subsequently, BW for SK>DK>TK=KA lambs (P<0.04). Lamb BW at 120d were 40, 41, 42 and 45±0.6 kg for KA, TK, DK and SK, respectively. On d30, ADG for SK>KA and TK while DK>KA (P<0.03). Generally, from d60–120, ADG for SK lambs>DK>TK=KA lambs (P<0.03). At d150–210, ADG for SK>KA and TK lambs (P<0.01), while DK lambs were intermediate. For ADG d0–d210, SK>DK=TK>KA (P<0.01; 0.16, 0.14, 0.14, and 0.13±0.002kg). The FEC were similar among all breed types at d90, but at d120, DK=SK(5069±877 epg)>KA=TK (1159±534 epg). Age at first deworming was approximately 20d less (P<0.04) for SK and DK lambs than for KA and TK lambs, fewer (P<0.05) TK lambs needed deworming than other breed lambs (43±7, 55±7, 67±7, 70±8% for TK, KA, DK and SK, respectively) and DK and SK lambs were dewormed more often (1.2±0.2 times each; P<0.01) than KA and TK lambs (0.7±0.1 times each). Overall, pasture-raised SK lambs grew faster than KA, DK, and TK lambs with DK lambs growing faster than KA and TK lambs. However, KA and TK had greater parasite resistance than SK and DK lambs.

**Key Words:** Katahdin, lamb, parasite

**102 The effect of feeding a split ration to lactating hair sheep on production traits during the cool season in the tropics.** R. W. Godfrey\* and R. C. Driscoll, University of the Virgin Islands, Agricultural Experiment Station, Kingshill, VI, USA.

Lactating St. Croix White and Dorper X St. Croix White ewes grazing guinea grass pastures during the cool season were used to evaluate the effect of feeding a split ration on production traits during the postpartum period. Ewes were assigned to treatments (n = 8/treatment) based on breed, age and number of lambs. Treatments consisted of feeding 0.9 kg concentrate (16.4 % CP, 68 % TDN) in the morning (AM) or afternoon (PM), 0.45 kg in the morning and afternoon (AM-PM) or no feed (Control) for 46 d beginning on d 6 (lambing = d 0). On d 21, 24-h milk production was measured. A sterile ram with a marking harness was used to detect estrus beginning on d 7. Lambs were weaned at 63 d of age. The mean temperature, relative humidity and THI during the study period were 25.8 °C, 85.9 % and 76.1, respectively. The AM-PM ewes consumed a higher (P < 0.001) percentage of their feed than AM and PM ewes (97.9 ± 0.5 vs. 88.0 ± 0.7 and 89.8 ± 0.7 %, respectively). The AM-PM ewes consumed a higher (P < 0.0001) percentage of their feed in both the AM and PM than either the AM or PM ewes (97.8 ± 0.7 and 98.2 ± 0.7 vs. 88.0 ± 0.7 and 89.7 ± 0.7 %, respectively). Percentage of weight lost during the 46-d period was greater (P < 0.003) in Control ewes, than in AM and PM ewes, and AM-PM ewes (8.2 ± 2.2, 1.6 ± 2.2, 1.9 ± 2.2 and 1.8 ± 2.2 %, respectively). Postpartum interval to estrus, milk production and litter weaning weight were not different (P > 0.10) among treatments (42.0 ± 1.2 d, 1366.3 ± 123.2 g, and 23.4 ± 0.9 kg, respectively). A split feeding regimen increased feed consumption and decreased postpartum weight loss without an increase in production traits of hair sheep ewes. The extra costs associated with this type of management may not be economically feasible considering the high cost of imported concentrate feed in the USVI.

**Key Words:** hair sheep, feed, environment

**103 Feedlot performance and digestibility of diets in meat goats supplemented with probiotics.** D. Cazac\*<sup>1</sup>, N.C. Whitley<sup>1</sup>, D.J. Jackson<sup>1</sup>, and B.J. Rude<sup>2</sup>, <sup>1</sup>University of Maryland Eastern Shore, Princess Anne, MD, USA, <sup>2</sup>Mississippi State University, Mississippi State, MS, USA.

Thirty-four female and male Boer crossbred goats were used in two experiments (Exp) to evaluate the influence of probiotics on goats fed a feedlot type diet. Goats were fed a commercially pelleted diet containing approximately 15 % crude protein (CP). In Exp 1, 24 animals at 18.9 ± 2.2 kg BW and 66.5 ± 2.1 d of age were weaned and placed in individual 1.2 m x 1.2 m pens with expanded metal floors and supplemented with probiotics (PRO; n = 12 goats) or wheat middlings (CON; n = 12 goats). Supplements were added on top of fresh feed daily to supply 42 g per goat/d which was within the recommended range for sheep (Fastrack; Conklin Co., Shakopee, MN). Water and feed were available on an ad libitum basis; BW and feed intake (FI) were measured on d 0 and then every 14 d for 56 d. Blood samples were collected via jugular venipuncture into tubes containing K3 EDTA on d 0, d 14 and then every 7 d until d 56. Subcutaneous vaccination for *Clostridium perfringens* type C & D, and *C. Tetani* (Intervet, Millsboro, DE) was administered after blood sampling on d 14 and 35. Plasma was collected and analyzed for IgG and IgA concentrations using radial immunodiffusion and ELISA, respectively. In Exp 2, ten male goats fed PRO or CON (n = 5/treatment) were used at 165.0 ± 2.1 d of age. Animals were placed in metabolism pens and after a 3-d adjustment period, FI, fecal and urine output were measured and 10% of feed, orts, urine and feces were sampled daily for 7 d to determine diet digestibility. In Exp 1, BW was not affected by PRO supplementation but was influenced by time (P < 0.001). Goat ADG, FI and FE as well as plasma concentrations of IgA and IgG were not influenced by probiotic supplementation. In Exp 2, apparent digestibility of organic matter, dry matter, NDF, ADF, CP, and GE was also not influenced by PRO supplementation. More research is suggested to determine the effectiveness of probiotics for meat goat production.

**Key Words:** meat goat, probiotics, digestibility

**104 Methane emission by goats consuming different sources of condensed tannins.** G. Animut\*<sup>1</sup>, R. Puchala<sup>1</sup>, A. L. Goetsch<sup>1</sup>, A. K. Patra<sup>1</sup>, T. Sahl<sup>1</sup>, V. H. Varel<sup>2</sup>, and J. Wells<sup>2</sup>, <sup>1</sup>American Institute for Goat Research, Langston University, Langston, OK, USA, <sup>2</sup>US Meat Animal Research Center, Clay Center, NE, USA.

Boer × Spanish (7/8 Boer; initial BW of 37.5 ± 0.91) wethers (24) were used to assess effects of different condensed tannin (CT) sources on methane emission. Diets were Kobe lespedeza (*Lespedeza striata*; K), K plus quebracho providing CT at 5% DMI (KQ), Sericea lespedeza (*Lespedeza cuneata*; S), and a 1:1 mixture of K and S (KS). Forages harvested daily were fed at 1.3 times the maintenance energy requirement. The experiment was 51 d divided into two phases. In phase 1 forage diets were fed alone, and in phase 2 25 g/d of polyethylene glycol (PEG) was given mixed with 50 g/d of ground corn. Adaptation periods were 28 and 7 d in phases 1 and 2, respectively. N concentration was 2.28 and 2.36%, in vitro true DM digestibility was 69.8 and 64.8%, and the level of CT was 14.0 and 15.1% for S and K, respectively. DMI was similar among treatments (776, 717, 806, and 800 g/d for K, KQ, S, and KS, respectively; SE = 51.7) and lower (P < 0.05) in phase 1 vs 2 (699 vs 851 g/d). OM

digestibility was similar between phases and averaged 47.8, 45.1, 40.1, and 43.7% for K, KQ, S, and KS, respectively (SE = 2.37). Treatment and phase interacted (P < 0.05) in N digestibility (phase 1: 51.4, 49.1, 28.0, and 41.3%; phase 2: 68.3, 65.0, 63.8, and 66.2% (SE = 3.02) for K, KQ, S, and KS, respectively). Methane emission was 14.3, 11.7, 16.2, and 14.1 l/d for K, KQ, S, and KS, respectively (SE = 1.25), and in phase 2 PEG markedly increased (P < 0.05) methane emission (9.0 vs 19.1 l/d). There was a substantial difference (P < 0.05) between phases in in vitro methane release by ruminal fluid incubated for 3 wk with conditions promoting activity by methanogens (11.5 and 22.9 ml in phases 1 and 2, respectively). Counts of total bacteria and protozoa were similar among treatments but considerably greater (P < 0.05) in phase 2 vs 1 (bacteria: 1.9 and 19.7 × 10<sup>11</sup>/ml; protozoa: 9.3 and 18.9 × 10<sup>5</sup>/ml). In summary, CT from different sources had disparate influence on N digestion but similar effects on ruminal microbial methane emission by goats, possibly by altering activity of ruminal methanogenic bacteria though change in actions of other bacteria and(or) protozoa may also be involved.

**Key Words:** Goats, Methane, Condensed tannins

**105 Nutritional and breed effects on carcass traits of Katahdin crossbred lambs.** D. J. Jackson\*<sup>1</sup>, N.C. Whitley<sup>1</sup>, J.W. Lemaster<sup>2</sup>, and S. Schoenian<sup>2,3</sup>, <sup>1</sup>University of Maryland Eastern Shore, Princess Anne, MD, USA, <sup>2</sup>Maryland Cooperative Extension, College Park, MD, USA, <sup>3</sup>WMREC, Keedysville, MD, USA.

At weaning, 43 Suffolk–(SK), Texel–(TK), and Dorper–(DK) sired Katahdin crossbred lambs were randomly removed from pasture and placed in a feedlot (GF), while 125 TK, SK, and DK lambs remained on pasture (PF) to determine the effects of feeding regime on carcass traits. At an average BCS of 2.8 (1–5 scale with 1=emaciated and 5=obese), 5 lambs/breed from both GF (134±1.2d of age) and PF (153±1.5d of age) were slaughtered to collect carcass data. The PF lambs had greater (P<0.05) transport BW loss (–1.9 vs –1.0±0.1kg) and greater (P<0.01) empty digestive tract weight (EDT; 5.3 vs 3.6±0.1kg), dressing percentage (50.7 vs 46.7±0.7%), LEA (17.9 vs 16.0±0.5cm<sup>2</sup>, leg circumference (85.5 vs 77.5±1.4cm), carcass length (103 vs 98.2±0.8cm) and retail cut weights (14.5 vs 13.2±0.3kg) compared to GF lambs. DK lambs had the lowest (P<0.01) pluck and retail weights (1.8±0.1 and 13.1±0.3kg, respectively) when compared to SK (2.1±0.1 and 14.2±0.3kg, respectively) and TK (2.0±0.1 and 14.3±0.3kg, respectively) lambs. EDT, hot and cold carcass weights were lower (P<0.05) in DK lambs (4.3±0.1, 19.0±0.5, and 18.7±0.4kg, respectively) than SK lambs (4.8±0.1, 20.8±0.5, and 20.3±0.4kg, respectively) while TK lambs (4.4±0.1, 20.3±0.5, and 19.9±0.4kg, respectively) were intermediate. SK lambs had longer (P<0.05; 107±0.8cm) carcasses than TK (97.8±0.8cm) and DK (97.1±0.8cm) lambs. DK lambs (3.6±0.3mm) had greater (P<0.05) back fat than TK lambs (2.4±0.3mm) while SK lambs (3.0±0.3mm) were intermediate. LEA was largest (P<0.01) in TK (18.3±0.65cm<sup>2</sup>) lambs compared to both DK (16.3±0.65cm<sup>2</sup>) and SK lambs (16.4±0.65cm<sup>2</sup>). In addition, the carcasses from TK lambs received the highest (P<0.05) quality grades and CIE L\* and hue angle values and SK lambs had the highest (P<0.05) mechanical shear force values. Overall, PF lambs had more muscle mass than their GF counterparts when slaughtered at a similar BCS, and sire breed had differential effects on carcass traits.

**Key Words:** Katahdin, carcass, lambs

**106 Feeding regime and breed effects on nutritional and sensory characteristics of meat from Katahdin crossbred lambs.** D.J. Jackson\*, N.C. Whitley, V. Suvanich, and J.G. Schwarz, *University of Maryland Eastern Shore, Princess Anne, MD, USA.*

Suffolk–(SK), Texel–(TK), and Dorper–sired (DK) Katahdin lambs were used to determine effects of feeding regime and sire breed on the fatty acid (FA) composition and sensory characteristics (feeding regime only) of lamb meat. At weaning, 43 TK, SK and DK lambs were randomly removed from pasture and placed in a feedlot (GF), while 125 TK, SK, and DK lambs remained on pasture (PF). At an average BCS of 2.8 (1–5 scale with 1=emaciated and 5=obese), 5 lambs/breed from both GF and PF were slaughtered. FA profiles were obtained from a commercial laboratory using 100g longissimus dorsi samples. Untrained adult consumers (61; mixed ethnicity) were used to determine any difference and preference in lamb patties prepared from GF and PF ground meat using a central location test. SFA, MUFA, PUFA, n–3, n–6 and n–6/n–3 fatty acids were influenced by feeding regime ( $P < 0.05$ ). PF lamb meat had increased ( $P < 0.001$ ) n–3 fatty acids but lower ( $P < 0.001$ ) n–6 fatty acids compared to GF meat. Subsequently, the n–6/n–3 fatty acid ratio was lowest ( $P < 0.0001$ ) in PF (1.45; 1–1.9 recommended by NIH) than in GF (8.75) meat. Although PF meat had a greater ( $P < 0.001$ ) total SFA and lower ( $P < 0.0001$ ) MUFA and PUFA content than GF meat, the ratio of UFA/SFA were similar between PF ( $0.6 \pm 0.02$ ) and GF ( $0.9 \pm 0.02$ ). Both UFA/SFA ratio and CLA content were influenced by a sire breed x feeding regime interaction ( $P < 0.05$ ). Grain–fed DK meat had a lower ( $P < 0.05$ ;  $0.7 \pm 0.02$ ) UFA/SFA ratio than SK ( $0.8 \pm 0.02$ ) and TK meat ( $0.8 \pm 0.02$ ) and PF DK meat had an increased ( $P < 0.01$ ) amount of CLA compared to both TK and SK meat. In the sensory test, consumers could not differentiate the overall eating quality of cooked lamb patties prepared from GF and PF meats. However, 58% of consumers preferred lamb patties prepared from PF meat. Overall, this study indicates that the meat from PF hair type lambs might be a healthier choice for consumers and supports the use of hair type lambs in a pasture–based production system.

**Key Words:** Katahdin, pasture, CLA

**107 Effects of genotype and diet on growth and mass of organs and tissues of growing meat goats.** A. T. Ngwa<sup>1</sup>, L. J. Dawson<sup>2</sup>, R. Puchala<sup>1</sup>, G. Detweiler<sup>1</sup>, R. C. Merkel<sup>1</sup>, G. Anmut<sup>1</sup>, T. Sahlu<sup>1</sup>, C. L. Ferrell<sup>3</sup>, and A. L. Goetsch<sup>\*1</sup>, <sup>1</sup>American Institute for Goat Research, Langston University, Langston, OK, USA, <sup>2</sup>College of Veterinary Medicine, Oklahoma State University, Stillwater, OK, USA, <sup>3</sup>US Meat Animal Research Center, Clay Center, NE, USA.

Young 3/4 Boer x 1/4 Spanish (BS) and Spanish (S) wethers were used to determine influences of diet and genotype on growth and mass of organs and tissues. A 50% concentrate pelleted diet (C) and one based on grass hay (H) were fed free-choice. Six wethers of each genotype were harvested at 0 wk as well as six of each diet and genotype at 14 and 28 wk. Initial BW was 21.6 and 18.8 kg for BS and S, respectively (SE = 0.67). The only genotype difference in initial organ or tissue mass relative to empty BW (EBW) was a tendency ( $P < 0.09$ ) for skin (10.38 vs 9.79% of EBW for BS and S, respectively). Average daily gain during the entire experiment was influenced by an interaction ( $P < 0.05$ ) between genotype and diet (199, 142, 44, and 50 g for BS-C,

S-C, BS-H, and S-H, respectively). Likewise, average (mean of wk 14 and 28) EBW was greater ( $P < 0.05$ ) for BS vs S with C and similar between genotypes with H (45.6, 34.8, 19.1, and 17.1 kg for BS-C, S-C, BS-H, and S-H, respectively). Carcass mass was greater ( $P < 0.05$ ) for C vs H (56.2, 56.2, 53.2, and 54.0% of EBW for BS-C, S-C, BS-H, and S-H, respectively). Mass of the liver (2.11, 1.92, 2.00, and 1.98% of EBW; SE = 0.048) and gastrointestinal tract (5.50, 4.83, 8.43, and 8.36% of EBW for BS-C, S-C, BS-H, and S-H, respectively; SE = 0.158) tended ( $P < 0.07$ ) to be influenced by an interaction between genotype and diet. Mass of internal fat (12.16, 12.09, 3.36, and 3.37% of EBW; SE = 0.364) and skin (9.55, 9.77, 11.97, and 11.27% of EBW for BS-C, S-C, BS-H, and S-H, respectively; SE = 0.281) differed ( $P < 0.05$ ) between diets but were not affected by genotype. In conclusion, growth advantages of growing Boer crossbred goats compared with Spanish, which occur with diets of high nutritive value, may not entail differences in mass of organs or tissues, other than relatively small ones for the liver and gastrointestinal tract mass that are in accordance with differences in growth rate.

**Key Words:** Meat goats, Growth, Body composition

**128 The effect of sericea lespedeza, fed as ground hay, on existing and establishing infection of *Haemonchus contortus* in sheep.** L. A. Chafon<sup>1</sup>, J. E. Miller<sup>\*1</sup>, J. A. Mosjidis<sup>2</sup>, T. H. Terrill<sup>3</sup>, and J. M. Burke<sup>4</sup>, <sup>1</sup>Dept. of Pathobiological Sciences, Louisiana State University, <sup>2</sup>Dept. of Agronomy and Soils, Auburn University, <sup>3</sup>Dept. of Animal Science, Fort Valley State University, <sup>4</sup>USDA ARS, Booneville, AR.

Control of *Haemonchus contortus* has traditionally relied on the use of anthelmintics. The development of anthelmintic resistance dictates that alternative approaches are needed. Grazing sericea lespedeza (SL, a forage containing condensed tannin), and feeding it as hay has reduced fecal egg count (FEC) in sheep and goats. This study evaluated the effect of ground SL hay on *H. contortus* infection in lambs. Twenty-eight lambs with essentially zero FEC were randomly allocated to 4 treatment groups (n=7 each). For Experiment 1, 2 groups received a bolus of 5000 *H. contortus* L3 once and the infection was allowed to mature over 35 d (existing infection). For Experiment 2, 2 groups received trickle infections of 500 *H. contortus* L3 3 times a week for 3 weeks (establishing infection). Ground SL hay was fed over a 35 d period to one each of the Experiment 1 and 2 groups while the other two groups were fed bermudagrass hay (control). Day 0 of feeding SL was after the 35 d establishment of Experiment 1 infection and at the beginning of Experiment 2 trickle infections. After the 35 d feeding period, all groups were fed bermudagrass hay for an additional 14 d. FEC was significantly ( $P < 0.05$ ) reduced in the Experiment 1 SL fed group over the feeding period. Similarly, FEC was lower in the Experiment 2 SL fed group, but the difference was not significant ( $P > 0.05$ ). After the SL feeding period, FEC increased in SL fed groups of both Experiments. This indicated an effect on female worm fecundity. There were fewer worms in the SL fed groups of both Experiments, but the differences were not significant ( $P > 0.05$ ). The trend of fewer worm numbers suggested that there may have been an effect on reducing infection level. Results indicate that ground SL hay reduced FEC of existing infections more so than establishing infections which could help reduce pasture contamination.

**108 Production traits of Dorper crossbred ewes in an accelerated lambing system in the tropics.** R. W. Godfrey\*, R. E. Dodson, M. C. Vinson, and R. C. Driscoll, *University of the Virgin Islands, Agricultural Experiment Station, Kingshill, Virgin Islands.*

There is little information on how Dorper x St. Croix White (DRPX) ewes will perform under tropical conditions. The objective of this study was to evaluate production traits of DPRX ewes in an accelerated lambing system. The DPRX ewes ( $n = 26$ ) were compared to an established St. Croix White flock (STX;  $n = 40$ ) over a period of 2 yr (4 lamb crops; 163 births). The DRPX ewes were introduced into the flock for their first lambing in March 2004. Subsequent lamb crops were produced in November 2004, July 2005 and March 2006. The STX ewes were older ( $P < 0.0001$ ) than DRPX ewes at the first lambing ( $4.2 \pm 0.3$  vs.  $1.0 \pm 0.4$  yr, respectively). Overall there was no difference ( $P > 0.10$ ) in the proportion of DRPX and STX ewes that were exposed to rams that lambed (88.7 vs. 80.4 %, respectively). There was no difference ( $P > 0.10$ ) between STX and DRPX ewes in weight at breeding ( $42.4 \pm 2.0$  vs.  $43.6 \pm 1.1$  kg, respectively) or weaning ( $42.5 \pm 1.8$  vs.  $45.4 \pm 0.9$  kg, respectively). Number of lambs born per ewe lambing was greater ( $P < 0.001$ ) in STX than in DRPX ewes ( $1.9 \pm 0.1$  vs.  $1.5 \pm 0.1$  lambs, respectively). Number of lambs born increased ( $P < 0.003$ ) in DRPX ewes from  $1.2 \pm 0.2$  to  $1.8 \pm 0.1$  between the first and third lamb crops but there was no change ( $P > 0.10$ ) in the STX ewes during this time ( $2.1 \pm 0.1$  vs.  $1.9 \pm 0.1$  lambs, respectively). Number of lambs weaned increased ( $P < 0.005$ ) in DRPX ewes from  $1.2 \pm 0.2$  to  $1.8 \pm 0.1$  between the first and third lamb crops but there was no change ( $P > 0.10$ ) in the STX ewes during this time ( $1.8 \pm 0.1$  vs.  $1.4 \pm 0.1$  lambs, respectively). Weaning percent was higher ( $P < 0.07$ ) in DRPX than STX ewes ( $95.2 \pm 3.1$  vs.  $83.6 \pm 5.6$  %, respectively). Litter weaning weight was higher ( $P < 0.009$ ) in DRPX than in STX ewes ( $22.7 \pm 0.8$  vs.  $19.7 \pm 0.7$  kg, respectively). Even though the DRPX ewes had fewer lambs born than STX ewes they produced heavier litter weaning weights. These results indicate that DRPX ewes can be used in an accelerated lambing system under tropical conditions.

**Key Words:** hair sheep, crossbreeding, lambs

**109 The effect of adequate or sub-optimal nutrition during anestrus on reproduction in crossbred does.** C. Rosales-Nieto\*<sup>1</sup>, J. Gudino<sup>1</sup>, M. D. Eaton<sup>1</sup>, K. Collard<sup>1</sup>, and R. L. Stanko<sup>1,2</sup>, <sup>1</sup>Texas A&M University-Kingsville., <sup>2</sup>Texas A&M University Agricultural Research Station, Beeville.

This study was conducted at 27° N with 32 mature crossbreed does from Feb. to Sept. (wk -2 to 32) in order to determine if sub-optimal nutrition affects induced reproduction in anestrus does. In Phase I, does with low BCS ( $1.6 \pm 0.4$ ; scale 1 to 5) were randomly assigned to either receive 150% (T-150) or 100% (T-100) of NRC requirements for maintenance. Initial mean ( $\pm$ SEM) BW (kg) for T-100 and T-150 was  $52.3 \pm 1.4$  and  $60.9 \pm 2.4$ , respectively. Amounts fed individually were adjusted bi-weekly. Ovarian activity was monitored by serum progesterone ( $P_4$ ) concentrations (ng/mL) measured weekly. Final BW (wk 24) differed ( $P < 0.01$ ) between T-100 ( $56.3 \pm 1.4$ ) and T-150 ( $74.9 \pm 2.8$ ). Final BCS was  $1.9 \pm .1$  for T-100 and  $4.4 \pm .2$  ( $P < 0.01$ ) for T-150. Serum concentration of  $T_3$  and  $T_4$  were similar throughout the

study ( $P > 0.1$ ), but NEFA (mEq/L) was greater ( $P < 0.05$ ) in T-100 ( $.087 \pm .009$ ) than in T-150 ( $.082 \pm .008$ ). On wk 22, 8/16 from both T-100 and T-150 does were randomly selected and received melengestrol acetate ( $.25$  MGA  $\text{mg} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$ ) for a period of 12 to 14 d; the rest of the does ( $n=8/\text{trt}$ ) served as controls (CON). Hence, treatments were T-100-MGA, T-150-MGA, T-100-CON, T-150-CON in a 2x2 factorial design. All does remained anestrus ( $P_4 \leq 1.0$  ng/mL) during 14-d following MGA. In Phase II (wk 28 to 30), 16 anestrus does ( $n=4/\text{trt}$ ) were randomly selected to determine the "male effect"; the rest were commingled into a single pen without a male (WOM). Blood was collected from all does every 2 to 4 d for 14-d. A greater ( $P < 0.05$ ) percentage of buck exposed does (100%, 16/16) had elevated  $P_4$  by d 12 as compared to WOM does (18.75%, 3/16). Crossbreed does appear to be able to regulate metabolism according to feed intake and weight gain. Anestrus does were not induced to ovulate with MGA alone. Sub-optimum nutrition during anestrus did not appear to influence responsiveness to the "male effect".

**Key Words:** melengestrol acetate, male effect, nutrition

**110 Estrus response and timing of ovulation in estrus synchronized goats and hair sheep treated with a combination of eCG and hCG.** S. Wildeus\* and J. R. Collins, *Virginia State University, Petersburg.*

Estrus synchronization systems for sheep and goats in the U.S. are limited by the lack of approved pharmacological products for these minor livestock species. This experiment evaluated the estrus response and timing of ovulation in goats and sheep treated with PG600<sup>®</sup> as a source of gonadotropin following progesterone administration. The experiment was conducted in April during seasonal anestrus using 3-yr old, mixed breed does and ewes (10/species), synchronized with progestagen-treated vaginal sponges (medroxyprogesterone acetate; 50 mg) for 11 d. At time of sponge removal, females were injected with prostaglandin (Lutalyse<sup>®</sup>, 15 mg dinoprost, im) and received either a standard (400 IU eCG/200 IU hCG) or half dose (200 IU eCG/100 IU hCG) of PG600. Vasectomized, harnessed males of the appropriate species were placed with each group (2 groups/species) to facilitate estrus detection, and females were observed for estrus in 4 h intervals for 96 h. Ovaries of all females were examined via laparoscopy for the occurrence of ovulation at 18, 30 and 42 h after gonadotropin treatment. Data were analyzed for the effect of species and gonadotropin dose on incidence and timing of estrus and ovulation. There was no significant effect of species on the incidence of estrus within 96 h (ewes: 10/10; does: 7/10), however, time to first estrus after gonadotropin treatment tended to be shorter ( $P=0.08$ ) in does (45.6 h) than in ewes (59.7 h). In contrast, 7/10 ewes, but only 1/10 does ( $P < 0.01$ ) ovulated within 42 h of gonadotropin treatment. Furthermore, the induction of ovulation in the ewes appeared to be dose-dependent with 5/5 ewes receiving the standard dose ovulating and only 2/5 ewes receiving the half dose. Results from this experiment suggest a species-specific response to PG600 treatment, with ovulation preceding the onset of estrus in sheep, and thus limiting its efficacy for use in artificial insemination schemes.

**Key Words:** sheep, ovulation, human chorionic gonadotropin

**111 Fertility of bucks in the Langston Buck Performance Test.** S. P. Hart\* and T. A. Gipson, *E (Kika) de la Garza American Institute for Goat Research, Langston University, Langston, OK.*

The objective of this study was to determine the incidence of infertility (based on a breeding Soundness examination) in young bucks that completed the Langston Buck test. Data was collected from each buck test from 1999 to 2006 (7 tests, 392 bucks). Semen was obtained by electroejaculation and concentration and motility evaluated immediately by microcopy. A semen sample was spread on a slide for determination of morphology. The breeding soundness examinations were conducted by a commercial semen processor (Reproduction Enterprise). Few bucks failed to pass the breeding soundness examination (15, 3.8%). Eleven goats failed to pass because of low sperm concentration or no sperm and four bucks failed to pass because of low motility which often was associated with abnormal morphology. Some of the bucks with low sperm concentration had cytoplasmic droplets. Only 5 of the 15 bucks failing to pass the breeding soundness examination had scrotal circumferences less than 24 cm. The average scrotal circumference on all animals was 26.3 cm (SD 2.63) and the average sperm concentration was 1.59 billion sperm /ml (SD .90). There is a low rate of Infertility in well managed buck kids older than 6 months.

**Key Words:** goats, reproduction, sperm

**112 Performance of goat kids grazing fescue alone or with supplement.** K. M. Andries\*<sup>1</sup>, J. Bernheart<sup>2</sup>, and S. Beaufont<sup>2</sup>, <sup>1</sup>*Kentucky State University, Frankfort,* <sup>2</sup>*WB Saul Agriculture High School, Philadelphia, PA.*

Many Southeast goat producers are utilizing entophyte infected pastures and supplemental feeding to achieve the desired performance from their goats. The objectives of this study were to: determine the effect of supplemental feeding on the growth of goats grazed on fescue pasture; determine if supplementation affected body condition score; and to determine the impact of supplementation on FAMACHA score. Fifty-two fall born commercial Boer cross kids were randomly assigned to one of two treatments: 1) pasture alone (CONT) or 2) pastures supplemented at 2.5% of body weight, with a 14% protein pellet (SUPP). The trial was conducted at the Kentucky State University Research and Demonstration Farm in Frankfort KY. Weight, body condition score, and FAMACHA scores were taken weekly for six weeks, in June and July, and data were analyzed utilizing GLM procedures in SAS. The traits of interest were final weight, average daily gain, change in body condition score, and average FAMACHA score. Weights were similar (31.1 vs. 30.9 kg) between treatments at the start of the study. Final weight was affected by sex ( $p < .01$ ) but not treatment ( $p = .079$ ). Average daily gain was higher (13.6 vs. 45.3 g/d, CONT vs. SUPP respectively) for SUPP ( $p < .01$ ). There were no differences ( $p > .05$ ) between treatments or sex for change in body condition score in this study. Average FAMACHA scores were not significantly affected by sex or treatment. However, FAMACHA scores were significantly affected by individuals indicating potential genetic differences for parasite loads. This study has shown that supplemental feeding of kid goats on fescue pasture during the summer can improve performance. Improvements in forage quality through introduction of desirable legumes or browse species and forage management strategies may produce similar results.

**Key Words:** goats, growth, fescue

**113 Initiating a pasture-based meat goat performance test in Western Maryland.** S. Schoenian\*<sup>1</sup>, J. Semler<sup>2</sup>, J. Deitz-Band<sup>1</sup>, W. Lantz<sup>4</sup>, and M. B. Bennett<sup>2</sup>, <sup>1</sup>*University of Maryland Cooperative Extension, Keedysville, MD,* <sup>2</sup>*West Virginia University Cooperative Extension, Martinsburg, WV,* <sup>3</sup>*University of Maryland Cooperative Extension, Boonsboro, MD,* <sup>4</sup>*University of Maryland Cooperative Extension, Mt. Lake Park, MD.*

A pasture-based meat goat performance test was initiated at the Western Maryland Research & Education Center in Keedysville, MD on June 10, 2006. The purpose of the test was to determine genetic differences of meat goats consuming a pasture diet with natural exposure to internal parasites. A blog (<http://mdgoattest.blogspot.com>) was established to enable consigners and other interested persons to follow the progress of the test. Thirty-five buck kids, 3 to 6 months of age, from six states were consigned to the inaugural test. Thirty-one bucks finished the test. Four were eliminated for health reasons. The goats were rotationally grazed for 112 days among five 2-acre paddocks of predominantly cool season grasses (tall fescue, orchardgrass, and chicory). Rotation was based on forage availability. The goats always had access to a central laneway containing port-a-hut shelters, minerals, water, and a handling system. They were dewormed at the start of the test and fecal samples were collected at 0, 28, and 56 d. They were handled every 14 d to determine FAMACHA© and body condition scores and the need for individual deworming. Fifty-one anthelmintic treatments were administered to the 31 goats for an average of 1.65 treatments per animal, excluding the initial deworming. Four goats did not require deworming during the testing period. Thirteen were treated once. Seven were dewormed twice. Only seven goats required 3 or more anthelmintic treatments. Boer x Kiko goats (n=9) required fewer dewormings than purebred Kiko (n=16) and high percentage Boer bucks (n=5). The goats were weighed every 28 days. ADG was  $117.0 \pm 16.8$  g,  $91.6 \pm 24.5$  g,  $132.9 \pm 8.6$  g, and  $4.5 \pm 7.7$  g, per day for the four 28-day periods. Overall gain averaged  $86.2 \pm 1.8$  g, per day.

**Key Words:** goats, pasture, performance

**114 Preweaning body weights of meat goat kids produced in a three-breed diallel managed on southeastern pastures.** R. Browning, Jr.\*<sup>1</sup>, B. Donnelly, T. Payton, and M. Byars, *IAgER-Tennessee State University, Nashville.*

Birth and weaning weights were recorded for meat goat kids produced over three years in a three-breed diallel involving Boer (B), Kiko (K), and Spanish (S) straightbred sires and dams. Weights were recorded within 24 hr of birth for 781 kids born in March and May of 2004, 2005, and 2006. Kidding season for each mo-yr contemporary group was no greater than 45 d long. Kids were not creep-fed and male kids were not castrated. Weaning weights were recorded for 635 kids at approximately 3 mo of age. Orphan kids were excluded from the weaning dataset. Weaning weights were adjusted to a 90-d standard. Year, month, sex, and litter size at birth each affected ( $P < 0.01$ ) birth weight. Buck kids were heavier ( $P < 0.01$ ) than doe kids ( $3.32$  vs.  $3.02 \pm 0.05$  kg). Single, twin, and triplet kids all differed from each other for birth weight ( $3.58$ ,  $3.20$ , and  $2.72 \pm 0.06$  kg, respectively). The sire breed x dam breed interaction was an important ( $P < 0.05$ ) source of variation for birth weight. Birth weights were heaviest for BxS, BxB, and BxK (3.44, 3.35, and 3.32 kg, respectively) and lightest for KxK and SxS kids ( $2.95$  and  $2.99 \pm 0.09$  kg). Year, month, sex, and litter size at birth and weaning each affected ( $P < 0.01$ ) preweaning ADG. Buck kids gained weight faster than doe kids ( $183$  vs.  $154 \pm 2$  g/d).



The sire breed x dam breed interaction was an important ( $P < 0.05$ ) source of variation for preweaning weight gain. Preweaning ADG were higher ( $P = 0.01$ ) for BxK and KxK (each 180 g/d) and lower ( $P < 0.01$ ) for SxS, KxS, and BxB (153, 156, and  $156 \pm 4$  g/d, respectively). Year, month, sex, and litter size at weaning each affected ( $P < 0.01$ ) 90-d weaning weight. Buck kids were heavier than doe kids ( $16.1$  vs.  $13.6 \pm 0.2$  kg). Single, twin, and triplet kids all differed from each other for weaning weight ( $17.7$ ,  $15.0$ , and  $11.9 \pm 0.3$  kg, respectively). The sire breed x dam breed interaction was an important ( $P < 0.01$ ) source of variation for weaning weight. Weaning weights were heaviest for BxK and KxK ( $16.3$  and  $15.9$  kg) and lightest for BxB and SxS ( $13.8$  and  $13.9 \pm 0.4$  kg). Sire and dam breeds interacted to influence meat goat kid weights at birth and weaning.

**Key Words:** meat goat, breed, growth

**115 Development of a dairy goat model to study the impact of management strategies on the dynamics of the herd** ‡. V. P. Guimarães<sup>\*1,2</sup>, L. O. Tedeschi<sup>2</sup>, and M. T. Rodrigues<sup>1</sup>, <sup>1</sup>*Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil*, <sup>2</sup>*Texas A&M University, College Station*.

A dairy goat model was built to study the dynamics of a herd over time under different management strategies. A system dynamics approach was used to develop the feedback structure of the model, which was programmed into Vensim<sup>®</sup>. The time unit was month with a time step of 0.03125. The model was developed to mimic a free-stall facility in

which the Does would stay in the herd for up to 5 lactations. Pregnancy rate was 35 to 65% for nuliparous and 65 to 80% for multiparous Does, and also randomized to add unexplained variation. The number of kids born per goat was assumed to be on average 1 for nuliparous and 1.5 for multiparous. The present model assumed one natural breeding season, meaning only one chance of birth per year. The gestation and lactation length was 5 and 7 months, respectively. Management strategies were manipulated through modifications of three key indexes: culling rate (CR), which is the percentage of culled animals per year; retention rate (RR), which is the percentage of retained animals that were born in the herd per year; and death rate (DR). A maximum of 300 animals were allowed in the herd. In the first simulation, 100 nuliparous Does, 0%/yr of CR, 100%/yr of RR, and 5%/yr of DR were assumed. In this scenario, five years were necessary to reach the herd capacity. In the second simulation, it was simultaneously assumed a CR of 20%/yr and a RR of 70%/yr in order to obtain a stable herd of 300 animals. A way to decrease the time to achieve the herd capacity could be reducing the DR of the kids or increasing reproductive rates. An increase in the pregnancy rate by 30% with a concomitant decrease in the death rate by 30% could decrease the time necessary to reach the maximal number of animals by 1 year. These results suggest that mathematical models can be used to understand the herd dynamics and to assist in applying best management strategies to enhance productivity of dairy goats. This model is necessary to further understand major feedback loops affecting dairy goat farm sustainability such as the impact of feed commodity price on milk production.

‡ Authors thank CAPES (Brazil) for financial support.

**Key Words:** simulation, goats, system dynamics

## Teaching and Undergraduate Education

**116 Reusable learning objects for enhanced information retention by students.** C. P. Bagley\* and L. L. Johnson, *Texas A&M University, Commerce*.

Reusable Learning Objects (RLOs) were developed as computer based, easily accessible self-help tutorials for use in a Feeds and Feeding class in Animal Science (AnS 307) and evaluated over a 2-yr period. Because many students have difficulty understanding protein quality and its relationship to animal nutrition, a series of RLOs were developed as tutorials for students to read and review following a classroom lecture on the subject. Pre-tests (PT) were given to students ( $n=56$ ) prior to a lecture on protein quality, and the same test instrument administered again following a lecture over protein quality (PT-L), followed by the students given the opportunity to review RLOs regarding protein quality and then administered the same test a third time (PT-RLO). Means scores for PT, PT-L and PT-RLO were 16.5%, 58.1% and 72.4%, respectively ( $P < .01$ ). The effects of the lecture and RLO compared to the pre-test were both linear ( $P < .01$ ) and quadratic ( $P < .01$ ) with some outcomes improved with RLOs, but some were satisfactory with only lecture. These results indicate the development of RLOs for difficult topics within a subject could be effective in increasing information retention by students. Having self-help tutorials available for specific subjects does appear to enhance student learning outcomes.

**Key Words:** Reusable learning objects, information retention, test scores

**117 Overview of instructional programs in mineral nutrition at Southeastern Land-Grant Universities.** M. M. Finnigan\*, *Auburn University, Auburn, AL*.

Instructional programs in mineral nutrition at Land-Grant Universities (LGU) are important because LGU have primary responsibility for training animal nutritionists and for conducting research leading to scientific and technological advancements in the field of mineral nutrition. The objective of this study was to collect pertinent information that could be formulated into an overview of instructional programs in mineral nutrition at LGU in the Southeastern US. The chair of each department of animal science(s) at LGU was sent an electronic questionnaire to obtain information on instructional programs in mineral nutrition. As questionnaires were returned, follow-up questionnaires were sent to faculty members based on recommendations from each department chair. Only 3.5% of faculty contacted responded. Due to the lack of response, results of their questionnaires were difficult to evaluate. Questionnaires sent to chairs consisted of five questions that were formulated in collaboration with various faculty members at Auburn University. In response to the first item, 85% of departments reported offering a course(s) involving mineral nutrition. Of these, 57% indicated that mineral nutrition was combined with other subject matter (e.g., vitamin nutrition) in a single course; 43% reported that mineral nutrition was taught as a single course. In response to the third and fourth items, 42% of responding departments had 150 or fewer students, 42% had 151 to 400, and 16% had 400 or more. The total number of undergraduates taking a mineral-nutrition course at each

institution ranged from 5 to 60. The last query asked for a breakdown of career paths selected by students upon graduation. Although the percentage of students going directly into research was low compared with other career paths, the actual percentage of students who eventually end up in research positions may be higher following post-graduate training. The information received from department

chairs indicated that many, but not most, students in animal science departments are exposed to mineral nutrition during their academic careers.

**Key Words:** mineral nutrition, land-grant universities, resident instruction

## Undergraduate Student Competition

**118 Detection of paratuberculosis in dairy cattle via near infrared reflectance spectroscopy of feces.** K. Anderson<sup>\*1</sup>, B. Norby<sup>2</sup>, S. Prince<sup>1</sup>, G. Ball<sup>3</sup>, and D. Tollerson<sup>1</sup>, <sup>1</sup>Texas A&M University, College of Agriculture and Life Sciences, College Station, <sup>2</sup>Texas A&M University, College of Veterinary Medicine, College Station, <sup>3</sup>Nottingham Trent University, Nottingham, England.

Paratuberculosis in dairy cattle is a chronic wasting disease caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP). The disease has a wide distribution in dairy cattle and is economically significant. Determining infection status is crucial in controlling the disease, however low sensitivities of current tests complicate this task. We investigated near infrared reflectance spectroscopy (NIRS) of feces as a diagnostic tool for paratuberculosis. NIRS is a rapid, non-invasive method of determining fecal constituents. Due to compromised ileal function, MAP should produce changes in the organic chemistry of feces, changes which should be detectable using NIRS. In 2004 and 2005, single fecal grab samples were collected from 62 mature lactating Holstein cows from the same dairy and subsequently processed for NIRS. Fecal spectra (400-2498nm) were collected using NIRS. Samples were identified as positive (P, n = 30) or negative (N, n = 32) for MAP using either ELISA and/or bacterial culture. Approximately 20% of each calibration (C) group were randomly selected and removed to create validation (V) groups. Discriminant calibrations were accomplished via 2-block partial least squares procedures. Calibration equations were developed for each year and both years combined. Validation consisted of: 1) 2005 C predicting 2005 V, 2) 2005 C predicting 2004 C, 3) 2004 C predicting 2005 C, and, 4) 2004 and 2005 combined C predicting 2004 and 2005 combined V. Calibration results (R<sup>2</sup> and SE cross validation) were: 0.80:0.42, 0.91:0.48 and 0.86:0.48 for 2004, 2005 and both years combined, respectively. Validation results (number correct/total per group) were: 3/5:4/5, 9/9:0/13, 7/7:4/8, and 4/7:4/8 for N and P, 1 through 4, respectively. Strong calibration statistics in this study, demonstrate a biochemical difference between P and N samples and the ability to discriminate between groups within years using NIRS. However, validation results with this form of analysis were sub par. This is likely due to low sample numbers and should be remedied in subsequent trials with greater numbers from different diets, points of infection and other contributing factors.

**Key Words:** Johnes, fecal NIRS, diagnostic

**119 Effect of carbohydrate and protein supplements on ruminal *in situ* disappearance of dry matter and fiber from coastal Bermuda-grass hay in goats.** A. P. Foote<sup>\*1</sup>, J. Struthoff<sup>1</sup>, B. D. Lambert<sup>1,2</sup>, and J. P. Muir<sup>2</sup>, <sup>1</sup>Tarleton State University, Stephenville, TX, <sup>2</sup>Texas Agricultural Experiment Station, Stephenville.

Little is known about the effects of ruminal protein or carbohydrate supplementation on ruminal dry matter (DM) and acid detergent fiber

(ADF) digestion in meat goats. The purpose of this experiment was to determine the effect of protein and carbohydrate supplements on ruminal degradation of Coastal Bermudagrass hay (CO) DM and ADF in CO-fed goats. Four mature rumen-cannulated wethers were used in a 4 × 4 Latin square design. Each period consisted of 14 days for treatment acclimation followed by the *in situ* ruminal incubations. Goats had *ad libitum* access to water and CO (13.4 % CP; 37.5 % ADF) at all times during the experiment. Treatments consisting of control, casein (0.12 % BW), dextrose (0.15 % BW), or starch (0.15 % BW) administered ruminally each day. Ruminal *in situ* incubations for 0, 2, 4, 8, 16, 24, 48, or 72 hours were performed to determine DM and ADF disappearance and degradation kinetics using the NLIN procedure of SAS. Dry matter was 32.4, 32.7, 32.8, and 33.3% degradable for casein, control, dextrose, and starch respectively. Rates of DM degradation were 3.85, 3.52, 3.55, and 3.22 % per hour for casein, control, dextrose, and starch respectively. Acid detergent fiber was 44.7, 43.3, 42.6, and 42.1% degradable for casein, control, dextrose, and starch respectively. Rates of ADF degradation were 6.02, 4.18, 4.17, and 3.62% per hour for casein, control, dextrose, and starch respectively. Treatments had no effect on ADF degradation (P>0.15). Casein increased rate of DM degradation compared with starch (P<0.05) and tended to increase rate compared with control (P=0.8) and dextrose (P=0.1). In summary, we observed no response in extent of ruminal ADF and DM disappearance and only a modest response in rate of DM degradation in goats supplemented with ruminal protein or carbohydrate. These data suggest that goat producers should consider foregoing energy supplementation when feeding medium to high quality CO to meat goats.

**Key Words:** supplementation, forages, small ruminant

**120 Pig performance in a split-weaning system using dry feed and limit-fed milk replacer.** J. A. Pittman<sup>\*</sup>, A. F. Harper, and M. J. Estienne, Virginia Polytechnic Institute and State University, Blacksburg.

The objective was to assess pig performance when split-weaning is employed to reduce suckling intensity on first-litter sows. Twelve litters of Yorkshire x Landrace pigs (10 to 15 pigs/litter, 149 pigs total) of similar age were used. At 9 to 10 d of age pigs in each litter were weighed. Three pigs representative of the weight range and sex ratio within each litter were selected for early-weaning and moved to 0.9 x 1.2 m nursery pens, provided *ad libitum* access to water and a complex phase I nursery diet, and access to a maximum of 500 mL daily of liquid milk replacer (Advance Liqui-Wean, MSC, Dundee, IL). Other pigs in each litter remained with their birth sow. After an 11 d period, all pigs were weighed and those still with the sow were weaned as intact litters into 1.2 x 1.8 m nursery pens with *ad libitum* access to water and the phase I diet. At this time daily milk replacer feeding for the early-weaned pigs was discontinued. Feeding of the phase I diet for all pigs continued for the next 7 d followed by feeding a phase

II diet for 9 d and a phase III diet for 16 d. During the initial period (11 d), pigs that remained with the sow had greater ADG than the early-weaned pigs (280 vs 144 ± 8 g/d,  $P < 0.001$ ) and consequently had greater BW (7.10 vs 5.58 ± 0.10 kg,  $P < 0.001$ ). During the second period (7 d) during which all pigs had been weaned, the conventionally weaned pigs had lower ADG (171 vs 336 ± 11 g/d,  $P < 0.001$ ) and lower ADFI (251 vs 506 ± 11 g/d,  $P < 0.001$ ) than the early weaned pigs. This pattern continued such that by the end of the overall 43 d trial, pig BW for the conventional and early weaned groups was similar (19.46 vs 20.12 ± 0.39 kg,  $P = 0.26$ ). During the time that both groups were on solid feed only, ADG was lower for the conventionally weaned pigs (386 vs 454 ± 11 g/d,  $P < 0.002$ ). Post-weaning death loss for the conventionally weaned pigs was 4.4%. No deaths were observed for the early weaned pigs. Under the conditions of this trial, providing ad libitum dry feed and limit feeding milk replacer for 11 d was an effective system for pigs weaned early (9 to 10 d of age) as part of a split-weaning strategy.

**Key Words:** pigs, split-weaning, performance

**121 Effects of social stress on pig behavior: The role of  $\alpha$ - and  $\beta$ -adrenergic receptors.** J. N. Landgrebe\* and J. C. Laurenz, *Texas A&M University-Kingsville*.

This study examined the effects of the  $\alpha$ - and  $\beta$ -adrenergic receptor antagonist, phentolamine and propranolol, on pig behavior during a social challenge. Pigs ( $n=24$ ) 13.7±0.4 kg) from 4 litters ( $n=3$  males and 3 females per litter) were housed by litter in four separate pens and maintained per current industry standards. Pigs were assigned by litter and gender to one of three treatments. Treatments included I.M. injections (5  $\mu$ g/kg body weight) of phentolamine (A), propranolol (B), or an equivalent volume of saline (C). Five minutes post-injection, pigs were subjected to a social confrontation test. Following the test, pigs were returned to their pens and allowed a 2-day rest period. The individual treatments were then rotated (A→B→C) and the social confrontation test was repeated twice. Hence, over the course of the study each pig was subjected to all three treatments. For the social confrontation test, three pigs from each of two litters were placed in a 1.5m x 1.5m open field for 30 min. Pigs were numbered and the test was videotaped and analyzed by four observers. The behavioral elements measured per pig included: (1) sniffing; (2) threat; (3) head knock; (4) biting; (5) fighting; (6) chasing; (7) fleeing; and (8) withdrawal. Aggression scores (AS) were calculated as the sum of elements 2 through 6 and non-aggression (NA) as the sum of 1, 7 and 8. Data were subjected to ANOVA using a split-plot design. Sources of variation included gender, litter, treatment and period. Pigs treated with A had AS similar ( $P>0.05$ ) to that of C pigs, while pigs treated with B had an increased ( $P<0.01$ ) AS (12.4 ± 1.9 and 5.9 ± 1.3 vs. 19.3 ± 4.1 for A and C vs. B, respectively). In contrast, pigs treated with B had NA scores similar to C, while pigs treated with A had an increased NA score (15.2 ± 2.9 and 12.0 ± 1.3 vs. 17.9 ± 2.4, for B and C vs A, respectively). Collectively these data suggest that activation of  $\alpha$ - and  $\beta$ -adrenergic receptors differentially effect pig behavior during a social confrontation test.

**Key Words:** pig, behavior, adrenergic

**122 WITHDRAWN BY AUTHOR.**

**123 Effects of melengestrol acetate on estrous synchronization in goats.** B. E. Galbreath\*, P. E. Prater, K. E. Peterson, W. T. McVey, and T. J. Wistuba, *Morehead State University, Morehead, KY*.

The purpose of this study was to monitor luteal response and synchronized pregnancy rates in goats using the oral progesterone compound, melengestrol acetate (MGA). This particular study endeavored to demonstrate the practicality and effectiveness of orally administered MGA on estrous cycle synchronization in female goats. MGA was administered as a feed additive to 14 of 28 does at a rate of 0.25 mg/hd/day to suppress estrous cycles. The MGA feed supplement was removed after 14 days in the treatment group and 10 mg of prostaglandin F2 alpha was administered intramuscularly to all 28 females to ensure complete luteolysis. These procedures were done to stimulate the does to cycle synchronously. Serum progesterone (P4) samples were taken on Day 1 and Day 9 post-MGA removal and levels were measured by radioimmunoassay. Does experiencing a rise in serum P4 > 1 ng/ml were classified as having had a luteal response. Does were bred naturally with proven bucks for a five - day period. All bucks were removed for a three week period and then re-introduced for an additional 5 days of natural breeding. Ultrasound pregnancy examinations were performed 60 days post-MGA removal. Ultrasound characteristics of pregnancy were evaluated for timing of mating based on presence and size of cotyledons, size and development of fetus, and size and development of the embryonic vesicle. In the control group (no MGA,  $n=14$ ), 0 out of 14 does demonstrated any significant luteal response (P4 > 1 ng/ml), whereas, the does fed 0.25 mg MGA/hd/day ( $n=14$ ) had a significantly greater luteal response ( $P<0.05$ ). Overall pregnancy rates for the control group and the treatment group (0.25mg/hd/day) were 50.0% and 92.9%, respectively. Ultrasound characteristics of these pregnancies revealed that in the control group, only one out of the seven pregnancies was from the synchronized breeding while the treatment group had a pregnancy rate of 53.8% from the synchronized breeding ( $P<0.05$ ). These results indicate that the dose of 0.25 mg/hd/day MGA should be beneficial in synchronizing estrus in does, resulting in a uniform, timely efficient kidding season.

**Key Words:** goats, synchronization, MGA

**124 Comparison of 5-day or 7-day CIDR-based estrous synchronization systems for fixed-time AI in beef heifers.** K. N. Wilson\*<sup>1</sup>, M. L. Day<sup>2</sup>, W. D. Whittier<sup>1</sup>, R. Kasimanickam<sup>1</sup>, and J. B. Hall<sup>1</sup>, <sup>1</sup>*Virginia Tech, Blacksburg*, <sup>2</sup>*The Ohio State University, Columbus*.

The objective of this experiment was to compare the efficacy of two CIDR-based estrous synchronization systems for fixed-time AI (FTAI) in replacement beef heifers. All heifers met minimum reproductive tract score (2 or greater), pelvic area (<150 sq. cm), and BW (> 300 kg) before assignment to treatment. Angus crossbred heifers ( $n = 233$ ) were stratified by body weight and randomly assigned to receive 1) a CIDR inserted for 5d (CIDR-5) or 2) CIDR inserted for 7d (CIDR-7). All heifers were given an injection GnRH (100  $\mu$ g, Cystorelin<sup>®</sup>, Merial) at CIDR (1.38 mg, Pfizer, NY) insertion and received an injection of PGF2 $\alpha$  (25 mg, Lutalyse<sup>®</sup>, Pfizer) at CIDR removal and 12h later. Heifers were bred by FTAI at 60 h (CIDR-7) or 72 h (CIDR-5) after CIDR removal. All heifers received GnRH at insemination. Heifers in both groups were observed for estrus by use of HeatWatch<sup>®</sup> (CowChips, Denver, CO). Heifers were bred to one of two AI sires by two technicians. Technician and AI sire were equalized over treatment.

All heifers were exposed to bulls beginning 10 d after AI. Pregnancy status and fetal age were determined by ultrasonography on d 48 and palpation d 100 after AI. There was a tendency ( $P < 0.09$ ) for more CIDR-5 heifers to exhibit estrus than CIDR-7 heifers (70.9 % vs 60.7%, respectively). Average hours from CIDR removal to estrus was greater ( $P < 0.002$ ) for CIDR-5 ( $50.9 \pm 1.1$  h) compared to CIDR-7 ( $45.4 \pm 1.2$  h). Pregnancy rates to FTAI were greater ( $P < 0.03$ ) for heifers synchronized with CIDR-5 (57.8%) compared to CIDR-7 (43.6%). Pregnancy rates were not affected ( $P > 0.01$ ) by AI service sire or AI technician. Pregnancy rate to natural service was not affected ( $P < 0.9$ ) by synchronization treatment (ave. 75.6 %). Overall pregnancy rates were similar ( $P < 0.4$ ) for CIDR-5 and CIDR-7 heifers averaging 88.0%. We conclude that reducing length of exposure to CIDR from 7 d to 5 d increased the percentage of heifers pregnant to fixed-time AI.

**Key Words:** heifer, estrous synchronization, fixed-time AI

**125 Identification of polymorphisms in the promoter region of the bovine heat shock protein gene and associations with bull calf weaning weight.** L. Starkey<sup>1</sup>, M. Looper<sup>2</sup>, A. Banks<sup>1</sup>, S. Reiter<sup>1</sup>, and C. Rosenkrans, Jr.<sup>1</sup>, <sup>1</sup>University of Arkansas, Fayetteville, <sup>2</sup>USDA/ARS, Booneville, AR.

Heat shock proteins (HSP) are a ubiquitously expressed, specific class of proteins that are induced by stressors such as extreme temperatures or hypoxia. Our objective was to evaluate the relationship between genotypic variation of the bovine HSP-70 promoter and bull calf weaning weights and serum concentrations of HSP-70 at weaning. Blood samples were collected from 33 crossbred bull calves. Calves were sired by Angus bulls and had Brahman-cross dams. Serum concentrations of HSP-70 at weaning were determined using an ELISA. Genomic DNA was extracted from buffy coats. Specific sequences of the HSP70 promoter region were amplified using PCR with the following primers (forward: GCCAGGAAACCAGAGACAGA; reverse: CCTACGCAGGAGTAGGTGGT). The resulting 539 base pair product was compared with GenBank accession number M98823. Ten single nucleotide polymorphisms (SNP) were identified at positions 895 (n = 4; 12.1 %), 1013 (n = 6; 18.2 %), 1045 (n = 1; 3.0 %), 1069 (n = 7; 21.2 %), 1096 (n = 1; 3.0 %), 1117 (n = 7; 21.2 %), 1125 (n = 13; 39.4 %), 1128 (n = 6; 18.2 %), 1154 (n = 1; 3.0 %), 1204 (n = 13; 39.4 %). Serum concentrations of HSP-70 (9.8 ng/mL) were not affected ( $P > 0.3$ ) by the identified polymorphisms; however, weaning weight was affected by two genotypes. Calves with the deletion at 895 tended ( $P = 0.1$ ) to have heavier weaning weights than the homozygous cytosine calves (318 vs 291 kg). At base 1128, homozygous thymine bull calves were heavier ( $P = 0.08$ ) than homozygous guanine bull calves. Other SNP sites were not associated with either serum HSP-70 concentrations or weaning weights. These results indicate that polymorphisms within in the promoter region of the HSP-70 gene are associated with weaning weights. The physiological mechanism of this association is not known, and warrants further study.

**Key Words:** HSP-70, cattle, genomics

**126 Relationship between polymorphisms in lactate dehydrogenase B gene and milk characteristics in beef cows.** C. Pope<sup>\*1</sup>, S. Reiter<sup>1</sup>, M. Brown<sup>2</sup>, Y. Farnell<sup>1</sup>, D. Baker<sup>1</sup>, H. Brown, Jr.<sup>1</sup>, Z. Johnson<sup>1</sup>, and C. Rosenkrans, Jr.<sup>1</sup>, <sup>1</sup>University of Arkansas, Fayetteville, <sup>2</sup>USDA/ARS, El Reno, OK.

Lactate dehydrogenase-B (LDH-B) is an enzyme involved in the inter-conversion of pyruvate and lactate. Our objective was to determine the genetic diversity in a segment of the LDH-B gene of cattle and its relationship to milk quality and quantity. Genomic DNA was collected from 134 cows. The cows were: Angus (n = 37), Brahman (n = 29), and Angus Brahman reciprocal crosses (n = 68). Specific primers for bovine LDH-B (LDHBF: GTACAGTCCTGCCTGCATCA; LDHBR: CCATTGTTGACTGGGTGA) were used for PCR amplification of a 452 base segment (based on GenBank accession number AJ401268). The PCR product was sequenced in both directions. Five single nucleotide polymorphisms (SNPs) were identified. The SNPs were located at base position 541, 606, 618, 652, and 669. Restriction enzyme cut sites were located at base positions 606 and 669 using the enzymes EcoRII and NcoI, respectively. Breed composition was associated ( $P < 0.001$ ) with genotype distribution. Seventy-six percent of the purebred Brahman cows were homozygous thymosine; whereas, 95 % of the purebred Angus cows were homozygous cytosine at the NcoI site. Cows were either grazing toxic tall fescue or bermudagrass. Milk samples were collected and analyzed for composition. Milk volume was affected ( $P < 0.1$ ) by NcoI genotypes. Homozygous cytosine cows had lower milk production than the heterozygous cows, and the homozygous thymine cows had intermediate milk production (18.1, 22.9, and 20.2 kg/d SE = 1.3, respectively). Milk butterfat content, protein content, and somatic cell counts were not affected by cow genotype ( $P > 0.3$ ); however, butterfat content and milk protein content were affected ( $P < 0.01$ ) by forage. Our results suggest that polymorphisms in the LDH gene may be useful in selecting cattle for milk production.

**Key Words:** LDH, cattle, genomics

**127 Impact of stressing a penmate on behavior and physiological responses of growing pigs.** J. B. Koonce\*, E. B. Kegley, D. L. Galloway, and J. K. Apple, University of Arkansas, Fayetteville, AR.

Crossbred barrows and gilts (n = 36), weighing  $16.6 \pm 2.1$  kg, were used to test the effects of stressing a penmate on the behavioral and physiological responses of growing pigs. Pigs were randomly allotted to 6 experimental groups, and stratified according to litter origin, gender, and BW. Dominance order was determined among the experimental groups, and 1 to 3 d prior to the stress experiment, the most and least dominant pigs within a group were fitted with indwelling jugular catheters for collection of whole blood. On each day of the study, treatment groups were: 1) isolated from audile and visual contact with stressed pigs in a separate room (non-stressed control); 2) separated from visual contact with stressed pigs by a curtain; or 3) allowed to remain on site to maintain audile and visual contact with the stressed pigs. Blood samples were collected 30, 15, and 0 min before stressor (snout-snare) treatment, then two randomly selected pigs from within 2 groups each day were snared and blood was subsequently

collected at 1, 2, 3, 4, 5, 7.5, 10, 15, 20, 25, and 30 min after stressor application and plasma cortisol was measured using direct RIA, whereas enzymatic assays were used to quantify plasma glucose and serum NEFA concentrations. There was no ( $P > 0.17$ ) treatment  $\times$  sampling time interactions for circulating levels of cortisol, glucose, or NEFA, and cortisol, glucose, and NEFA concentrations were not affected by treatment group ( $P > 0.42$ ) or gender ( $P > 0.48$ ). Moreover, plasma glucose ( $P = 0.70$ ) and serum NEFA ( $P = 0.55$ ) levels were similar before and during stressor treatment; however, cortisol levels appeared to increase ( $P < 0.05$ ) from 0 to 10 min after snaring, and

subsequently decline thereafter. Lastly, plasma glucose levels were similar ( $P = 0.62$ ) across the 3 d; however, plasma cortisol levels tended to be greater ( $P = 0.10$ ) on d 2 than 1 of the experiment, whereas serum NEFA levels measured on d 3 were greater ( $P = 0.01$ ) than levels measured on d 1 and 2. Results suggest that humeral measures of the stress response are not affected by the visual and/or audile contact with penmates undergoing a stressful event.

**Key Words:** penmates, pigs, stress

# 2007 SOUTHERN SECTION ASAS COMMITTEES

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Coleman, DA - AL (President)  
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1985–86	B. Baker, Jr.	Mississippi State University	1950–51	H.H. Levek	Mississippi State University
1984–85	C.B. Ammerman	University of Florida	1949–50	J.E. Foster	University of Maryland
1983–84	W.G. Luce	Oklahoma State University	1948–49	H.M. Briggs	Oklahoma State University
1982–83	J.R. Hill	Clemson University	1947–48	E.C. Godbey	Clemson University
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1975–76	C.J. Brown	University of Arkansas	1936–37	M.P. Jarnigan	University of Georgia
1974–75	S.L. Hansard	University of Tennessee	1935–36	J.B. Francioni	Louisiana State University
1973–74	M. Koger	University of Florida	1934–35	A.L. Shealy	University of Florida
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1971–72	G.E. Mitchell, Jr.	University of Kentucky	1932–33	W.L. Blizzard	Oklahoma State University

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2006	Gary M. Hill	Georgia	1986	Lemuel Goode	North Carolina
2005	Samuel W. Coleman	USDA	1985	O.M. Hale	Georgia
2004	Don G. Ely	Kentucky	1984	L.C. Ulberg	North Carolina
2003	Don E. Franke	Louisiana	1983	C.J. Brown	Arkansas
2002	Fred Thrift	Kentucky	1982	W.C. McCormick	Georgia
2001	Robert Wettmann	Oklahoma	1981	Elliot R. Barrick	North Carolina
2000	Philip Utley	Georgia	1980	J.A. Whatley, Jr.	Oklahoma
1999	Paul R. Noland	Arkansas	1979	Marvin Koger	Florida
1998	Not Given		1978	Thomas J. Marlowe	Virginia
1997	William G. Luce	Oklahoma	1977	Sam Hansard	Tennessee
1996	Raymond W. Harvey	North Carolina	1976	J.C. Hillier	Oklahoma
1995	Gary L. Cromwell	Kentucky	1975	J.K. Riggs	Texas
1994	George E. Mitchell, Jr.	Kentucky	1974	T.J. Cunha	Florida
1993	L.E. McDowell	Florida	1973	O.D. Butler	Texas
1992	Joseph Fontenot	Virginia	1972	George W. Litton	Virginia
1991	Robert Totusek	Oklahoma	1971	Ray H. Dutt	Kentucky
1990	Virgil Hays	Kentucky	1970	Robert C. Carter	Virginia
1989	Frank Baker	Arkansas	1969	Henry H. Leveck	Mississippi
1988	Clarence B. Ammerman	Florida	1968	Wesley P. Garrigus	Kentucky
1987	Lowell E. Walters	Oklahoma	1967	Byron L. Southwell	Georgia
			1966	Charles S. Hobbs	Tennessee

## Extension Award

2006	Allen F. Harper	Virginia	1993	J.R. Jones	North Carolina
2005	Glen Selk	Oklahoma	1992	James B. Neel	Tennessee
2004	Roger L. McCraw	North Carolina	1991	Keith Lusby	Oklahoma
2003	Darrh Bullock	Kentucky	1990	Joe Hughes	Oklahoma
2002	Warren Gill	Tennessee	1989	Henry Webster	Clemson
2001	Walter R. Burris	Kentucky	1988	Donald R. Gill	Oklahoma
2000	Tom R. Troxel	Arkansas	1987	H. John Gerken, Jr.	Virginia
1999	George V. Davis, Jr.	Arkansas	1986	M.K. Cook	Georgia
1998	G. L. Monty Chappel	Kentucky	1985	W.G. Luce	Oklahoma
1997	Steven H. Umberger	Virginia	1984	Charles Cooper	Virginia
1996	Clyde D. Lane, Jr.	Tennessee	1983	C.W. Absher	Kentucky
1995	John T. Johns	Kentucky	1982	C.M. Triplett	Georgia
1994	David W. Freeman	Oklahoma	1981	Arden N. Huff	Virginia
			1980	A.L. Eller, Jr.	Virginia



## Young Animal Scientist Award

2006 <sup>2</sup>	Scott T. Willard	Mississippi State University	1995 <sup>2</sup>	Jeffrey D. Armstrong	NC State University
2006 <sup>1</sup>	Michael L. Looper	USDA, ARS	1994 <sup>1</sup>	Debra K. Aaron	University of Kentucky
2005 <sup>2</sup>	Clinton Krehbiel	Oklahoma State University	1994 <sup>2</sup>	Peter J. Hansen	University of Florida
2004 <sup>1</sup>	M. Todd See	NC State University	1993 <sup>1</sup>	Kevin Pond	NC State University
2004 <sup>2</sup>	Theo Van Kempen	NC State University	1993 <sup>2</sup>	Rod Geisert	Oklahoma State University
2003 <sup>1</sup>	Sam Jackson	Texas Tech University	1992 <sup>1</sup>	David S. Buchanan	Oklahoma State University
2003 <sup>2</sup>	Tom Spencer	Texas A&M University	1992 <sup>2</sup>	James L. Sartin	Auburn University
2002 <sup>1</sup>	Joel Yelich	University of Florida	1991 <sup>1</sup>	W.E. Beal	VPI & SU
2002 <sup>2</sup>	Beth Kegley	University of Arkansas	1991 <sup>2</sup>	Wayne Greene	Texas A&M University
2001 <sup>1</sup>	Shawn Ramsey	Texas A&M University	1990 <sup>1</sup>	J.W. Mabry	University of Georgia
2001 <sup>2</sup>	Jason Apple	University of Arkansas	1990 <sup>2</sup>	T.H. Welsh	Texas A&M University
2000 <sup>1</sup>	Andy D. Herring	Texas Tech University	1989	J.W. Spears	NC State University
1999 <sup>2</sup>	Chad C. Chase, Jr.	USDA, ARS	1988	S.B. Smith	Texas A&M University
1998 <sup>1</sup>	Markus F. Miller	Texas Tech University	1987	D.L. Thompson, Jr.	Louisiana State Univ.
1998 <sup>2</sup>	Arthur L. Goetsch	Langston University	1986	G.J. Hausman	USDA, ARS, Athens, GA
1997 <sup>1</sup>	Tim Marshall	University of Florida	1985	J.W. Savell	Texas A&M University
1996 <sup>1</sup>	William L. Flowers	NC State University	1984	D.R. Notter	VPI & SU
1996 <sup>2</sup>	Markus F. Miller	Texas Tech University	1983	T.S. Stahly	University of Kentucky
1995 <sup>1</sup>	Craig H. Wood	University of Kentucky	1982	D.N. Marple	Auburn University

<sup>1</sup>Education

<sup>2</sup>Research

## NPB Swine Industry Award

2006	Jeffery A. Carroll	USDA, ARS	1999	Not given	
2005	Zelpha B. Johnson	University of Arkansas	1998	Robert A. Cushman	NC State University
2004	Jason Apple	University of Arkansas	1997	M. Todd See	NC State University
2003	Theo van Kempen	NC State University	1996	William L. Flowers	NC State University
2002	Kim Cole	University of Arkansas	1995	M. Todd See	NC State University
2001	G. E. Conatser	University of Tennessee	1994	Robert Dove	University of Georgia
2000	Not given				

## Graduate Student PaperAward

<b>Year</b>	<b>Awardee</b>	<b>Place of Meeting</b>	<b>University</b>
2006	L. R. Legleiter	Orlando	North Carolina State University
2005	Margaret Bowman	Little Rock	University of Arkansas
2004	E. G. Brown	Tulsa	Texas A&M University
2003	C. Realini	Mobile	University of Georgia
2002	J. A. Parish	Orlando	University of Georgia
2001	J. Montgomery	Ft. Worth	Texas Tech University
2000	M. R. Stivarious	Lexington	University of Arkansas
1999	T. E. Engle	Memphis	North Carolina State University
1998	C. Barnett	Little Rock	Univ. of Tennessee
1997	D.H. Crews, Jr.	Birmingham	Louisiana State University
1996	None Given		
1995	E.B. Kegley	New Orleans	North Carolina State University
1994	R.D. Coffey	Nashville	University of Kentucky
1993	D.K. Bishop	Tulsa	Oklahoma State University
1992	R.L. Stanko	Lexington	North Carolina State University
1991	G.A. Rohrer	Ft. Worth	Texas A&M University
1990	K.A. Meurer	Little Rock	Mississippi State Univ.
1989	G.M. Davenport	Nashville	University of Kentucky
1988	M.J. Esteinne	New Orleans	University of Georgia
1987	T.W. Burnell	Nashville	University of Kentucky
1986	M.J. Wylie	Orlando	Texas A&M University
1985	M.W. Richards	Biloxi	Clemson University
984	J.C. Betts	Nashville	Texas A&M University
1983	J.B. Lutz	Atlanta	University of Georgia
1982	K.R. Pond	Orlando	Texas A&M University
1981	L.W. Greene	Atlanta	VPI & SU
1980	D.K. Aaron	Hot Springs	University of Kentucky
1979	T.W. Robb	New Orleans	University of Kentucky
1978	E.F. Gray	Houston	University of Kentucky
1977	T.A. Puglisi	Atlanta	University of Georgia
1976	D.L. Thomas	Mobile	Oklahoma State University
1975	J.C. Cornwell	New Orleans	Louisiana State University
1974	D.M. Hallford	Memphis	Oklahoma State University
1973	A.C. Mills	Atlanta	University of Florida
1972	C. McLellan, Jr.	Richmond	Oklahoma State University
1971	C.L. Fields	Jacksonville	University of Kentucky
1970	A.R. Bellve	Memphis	North Carolina State University
1969	W.L. Brown	Mobile	Auburn University
1968	W.E. Powell	Louisville	Auburn University
1967	F.W. Bazer	New Orleans	North Carolina State University
1966	D.G. Ely	Jackson	University of Kentucky
1965	R.D. Goodrich	Dallas	Oklahoma State University
1964	C.K. Vincent	Atlanta	North Carolina State University
1963	C.B. Ramsey	Memphis	University of Tennessee
1962	J.R. Crockett	Jacksonville	University of Florida

## Undergraduate Student Paper Award

<b>Year</b>	<b>Awardee</b>	<b>Place of Meeting</b>	<b>University</b>
2006	D. Sykes	Orlando	Mississippi State University
2005	N. Burdick	Little Rock	Texas A&M
2004	J. L. Roberts	Tulsa	Oklahoma State University
2003	M. Seitz	Mobile	Mississippi State Univ.
2002	B. Spader	Orlando	University of Missouri
2001	R. Horsley	Ft. Worth	Virginia Polytechnic Univ.
2000	B. Robbins	Lexington	Virginia Tech
1999	J. L. Bardugone	Memphis	Virginia Tech
1998	S. F. Flohr	Little Rock	Virginia Tech
1997	T. M. Weick	Birmingham	Louisiana State Univ.
1996	K. J. Goodson	Greensboro	Texas A&M University
1995	B. C. Bloom	New Orleans	Auburn University
1994	Beth Good	Nashville	Oklahoma State University
1993	C. J. Kirby	Tulsa	North Carolina State University

## Academic Quadrathlon Winners

2006	Texas A&M University	1994	Oklahoma State University
2005	North Carolina State University	1993	Texas A&M University
2004	University of Kentucky	1992	Oklahoma State University
2003	Texas A&M University	1991	University of Kentucky
2002	University of Florida	1990	Virginia Tech
2001	University of Kentucky	1989	Oklahoma State University
2000	Texas A&M University	1988	Texas A&M University
1999	University of Kentucky	1987	University of Georgia
1998	University of Kentucky	1986	University of Georgia
1997	Oklahoma State University	1985	University of Kentucky
1996	Oklahoma State University	1984	Texas A&M University
1995	Virginia Tech		

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