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FUTURE MEETING DATES AND LOCATIONS

2017	**Franklin, Tennessee**	**February 4–7, 2017**
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BREEDING AND GENETICS

001 Heritability of temperament at weaning in a crossbred cattle population.

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The objective of this experiment was to estimate the heritability of temperament as well as examine the relationship of cow age, proportion of *Bos indicus*, and contemporary group with calf temperament at weaning. The study population consisted predominantly of British-crossbred cattle. Temperament was quantified by 3 measures: 1) pen score (PS) was the reaction of each calf to a constant single experienced evaluator on a scale of 1-5 (1 = calm and 5 = excitable); 2) exit velocity (EV) was the rate in m/sec at which a calf traveled 1.83 m upon exiting the squeeze chute; and 3) temperament score (TS) was the simple mean of PS and EV. Data were analyzed with mixed linear models. Additive genetic variance was a random effect, and maternal additive genetic variance was 0 for all traits. Fixed effects included cow age (2, 3, 4, 5 to 10, and >10 yr of age). Covariates included the d of age at the time of record and the proportion of *Bos indicus* in each calf. Contemporary groups (n=69) clustered calves of the same sex classification (bull=543, heifer=1622, steer=1158) born in the same season (Fall=975, Spring=3248) of the same year (2002 to 2014). Estimates of heritability were obtained in univariate analyses, and correlation in 2-trait analyses. These traits had strong additive genetic correlation estimates with each other (r > 0.8). Cow age and contemporary group had an effect on calf temperament ($P < 0.01$). There was a positive relationship ($P < 0.05$) of proportion of *Bos indicus* with calf PS, EV, and TS (regression coefficients were 0.758 ± 0.324, 1.268 ± 0.322, 1.002 ± 0.283; respectively). There was a negative relationship ($P < 0.01$) of the d of age of the calf with PS, EV, and TS (regression coefficients were -0.006 ± 0.001, -0.003 ± 0.001, and -0.005 ± 0.001; respectively). At weaning, estimates of heritability were 0.32 ± 0.05 for PS, 0.28 ± 0.05 for EV, and 0.35 ± 0.05 for TS. In conclusion, calf temperament at weaning was associated with cow age, proportion of *Bos indicus*, and contemporary group. The degree of heritability reported for PS, EV, and TS was sufficient to substantiate utilization of either or all of these measures of temperament as selection tools.

Keywords: Heritability, Temperament, Cattle

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002 Effect of Nystatin, a Lipid Raft Inhibitor on Bovine Blood.

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This study was conducted to evaluate the effect of the lipid raft inhibitor Nystatin on gene activation in cow blood. Blood was collected from four adult female Holstein Friesian cows (N=4) and incubated with 100ngmL^{-1} of Nystatin. Phosphate-buffered saline (PBS) served as negative control. Total protein concentration and prostaglandin E2 alpha in plasma were determined. Total RNA was isolated from cells using Trizol. Samples with RNA integrity number >7 were used for cDNA synthesis. The effect of Nystatin on expression of 84 genes on the cow wingless signaling pathway and human innate and adaptive immunity arrays was assessed in cow blood using real time PCR (Qiagen). Fold change in transcript abundance was calculated using the Livak method. Transcription of TLR2, TLR4, WNT, FZD, β catenin, TNF α and GAPDH was also validated using real time PCR. Agarose gel electrophoresis and Ethidium Bromide staining was used to visualize amplicons. All genes on the wingless signaling array were expressed. The genes DAB2, FABW11, FZD3, YWHAZ, WNT9A and WISP1 were up regulated on the cow wingless signaling pathway. On the human innate and adaptive array, 29 genes were expressed in untreated samples and 60 genes were expressed in Nystatin treated samples. On the human innate and adaptive array, MAPK1, MAPK8, TLR7, IL10 and CD40, were upregulated. The genes APCS and IFNA1 were inhibited by nystatin on the human innate and adaptive array. Nystatin increased total plasma protein and PGE2α in cows and thus had a pro-inflammatory effect. Exposure to Nystatin modulates transcription and translation of genes involved in innate immunity and the wingless signaling pathway in cow blood. These changes may be due to cell associated lipid raft inhibiton by Nystatin and should be considered in the design and use of Nystatin containing drugs in cows.

Keywords: Nystatin, signaling pathway, lipid raft

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003 Genome wide association of beef flavor and tenderness in steaks (with electrical stimulation and without) from carcasses of Nellore-Bos taurus steers.

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The quality of beef products is influenced by flavor; identification of genes that influence meat flavor might be beneficial for improvement of quality. Flavor results from the combination of basic tastes (sweet, sour, bitter, salt and umami) that arise from water-soluble compounds and odor derived from numerous substances present in the beef. The objectives were to statistically associate SNP genotypes with beef sensory lexicon traits, and identify the closest gene to each associated SNP in steaks after electrical stimulation (ES) or without electrical stimulation (NON). Nellore-Angus F_2 steers (n = 279), from full- and half-sibling families, were fed a grain-based diet until slaughter. One half of each carcass was exposed to ES. Steers had genotypes for 54,001 SNP markers; 34,980 remained after quality editing. Sensory traits from the beef lexicon were measured as subjectively assigned scores of 1 (unfavorable) to 8 (favorable) by trained panelists. Overall tenderness was similarly assigned by a trained panel. Associations were evaluated as linear regressions on genotype values in separate analyses for ES and NON. Other fixed effects included year-season combinations and age at slaughter. The genomic relationship matrix was included. From ES steaks, there were 42 suggestive associations for flavor traits (acid, cardboard, metal, musty, soured) and 20 for overall tenderness (FDR < 0.15). From analyses of NON records, there were 5 suggestive associations for flavor traits (nutty, soured, and sweet) and 6 for tenderness (FDR < 0.15). Candidate genes closest to associated markers were identified; among the most convincing of those included: acid flavor with ataxin1 (BTA 23), which acts to increase levels of ascorbic acid and decrease levels of threonate; musty flavor with secretogranin II (BTA 2), an acidic compound secreted by the endocrine system; cardboard flavor with nucleus accumbens associated 1 (BTA 7), that has an effect in the metabolism of fatty acids. Cadherin 7 (BTA 24) and EGF containing fibulin-like extracellular matrix protein 2 (BTA 29) were genes close to the markers for overall tenderness, which are proteins involved in cell-cell adhesion and fibrogenesis, respectively. All but one suggestive association with tenderness was on BTA 29; 3 markers were identified for overall tenderness in analyses of both ES and NON data. Although there were few suggestive associations, their identification may be a useful initial step in characterization of possible exploitable genetic variation for improvement of the quality of beef products.

Keywords: GWAS, beef flavor, tenderness, Nellore, crossbreeding.

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Table 004. Number of cows per breed, proportion of cows in the herd at 5 and 10 yr age and average age at removal[1]

Cow breed	N	5 yr	10 yr	Age at removal, yr
A	51	0.63 ± 0.07	0.16 ± 0.05	6.9 ± 0.52[a]
B	28	0.71 ± 0.09	0.07 ± 0.05	7.0 ± 0.70[a]
BA	52	0.71 ± 0.06	0.54 ± 0.07	9.0 ± 0.57[bc]
ABBA	24	0.63 ± 0.10	0.42 ± 0.10	8.4 ± 0.80[ac]
BABA	25	0.40 ± 0.10	0.08 ± 0.05	5.7 ± 0.75[a]

[a,b,c]Age at removal means that do not share a superscript differ ($P < 0.05$).

[1] The F_1 survival curve in its entirety differed from all except ABBA; however, proportions surviving to these ages were not otherwise statistically compared.

004 Longevity of Brahman, Angus, F_1 and F_2 Brahman-Angus cows.

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The objective of these analyses was to compare longevity and survival curves of straightbred and crossbred Brahman and Angus cows in production from 1997 to 2015. Cows were culled after failing to wean a calf twice (starting at 2-yr-olds), except for Brahman which typically calved first as 3-yr-olds and then culled after two failures. Breed groups evaluated were Angus (A), Brahman (B), F_1 Brahman-sired cows (BA), F_2 cows sired by Angus-sired (AB) F_1 bulls and out of BA dams (ABBA), and F_2 cows sired by BA and out of BA dams (BABA). Data were analyzed using a survival model that included cow breed, birth year, and censoring status. Two cows were censored from the study because they were in the herd at the latest time of observed data (1 ABBA and 1 BABA). Longevity (age at removal) was analyzed in a fixed effects model using all cows (none censored) with fixed effects of birth year and cow breed. The current age was used for the two remaining cows. The F_1 survival curve differed from Angus, Brahman, and BABA F_2 ($P < 0.05$). Means obtained from two survival curve time points for breed groups are shown in Table 004. F_1 cows had later ($P < 0.05$) age at removal than Angus, Brahman, and BABA. ABBA cows had later ($P < 0.05$) age at removal than BABA (Table 1). There was heterosis for cow longevity in the F_1, but an apparent reciprocal difference between the two types of F_2s.

Keywords: longevity, *Bos indicus-Bos taurus* crosses

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005 Relationships Between Prolactin Genotypes and Beef Cow Profitability.

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Prolactin (PRL), an endocrine hormone primarily secreted by the anterior pituitary gland, has been previously associated with reproductive traits. Our objective was to determine the associations between the PRL gene and cow-calf profitability traits. Genomic DNA was extracted from buffy coat samples of Angus-based crossbred cows (n = 131). Genotypes (GeneSeek, Lincoln, NE) for mutations in the bovine PRL gene were determined at three SNP sites, two in the promoter region (A1128T, and C1286T), and one in the coding sequence (G8398A). Three years (2012, 2013, and 2014) of performance data were used to determine relationships to SNP genotypes. Performance traits included: Julian calving date, cow BW at weaning, cow BCS at weaning, calf weaning weight, and cow efficiency (calculated by dividing calf weaning weight by cow weight at weaning). Relationships were determined using mixed model ANOVA with genotype and year as the main effects. When F-tests were significant means were separated using multiple t-tests and Tukey's adjustment. Cows carrying the primary allele (CC, n = 48; CT, n = 63) at SNP C1286T had greater ($P < 0.05$) BCS than TT (n = 20) cows (5.2, 5.02, and 4.98; respectively), whereas animals with the TT (n = 20) genotype had greater cow efficiency ($P = 0.01$). Calf weights at weaning tended ($P = 0.11$) to be greater for CC calves. Cow efficiency was ($P = 0.04$) greater for cows carrying the major allele in the A1128T SNP (AA, 0.42; AT, 0.40), whereas AT cows tended ($P = 0.06$) to have an earlier Julian calving date compared to homozygous cows (AT, 265 d; AA, 270 d). At SNP G8398A, cows homozygous for the minor allele (AA, n = 14) had an increased BW ($P = 0.01$) at weaning when compared with other genotypes (GA, n = 48; GG, n = 69; 515, 479, 483 kg, respectively). The PRL gene may play a relevant role in selecting individuals with advantageous phenotypes for profitability.

Keywords: Prolactin, Single Nucleotide Polymorphism, Cow Efficiency

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Table 006. Least squares means for F_2 and F_3 Nellore-Angus steer weights by calf type.

Calf type	n	Birth weight, kg	Weaning weight, kg	Yearling weight, kg	15-mo weight, kg
ANAN	23	34.6 ± 1.83	226.8 ± 6.14[a]	288.3 ± 9.37[a]	397.0 ± 12.91
ANNA	68	35.1 ± 1.29	229.8 ± 4.24[a]	286.9 ± 6.58[a]	392.3 ± 9.14
NAAN	31	36.6 ± 1.64	234.1 ± 5.47[a]	292.6 ± 8.36[a]	407.0 ± 11.62
NANA	62	36.4 ± 1.37	222.6 ± 4.50[a]	275.0 ± 6.98[b]	381.7 ± 9.70
F3	188	35.2 ± 1.19	206.6 ± 3.91[b]	264.3 ± 6.05[b]	369.8 ± 8.40

006 Age-related weights of second and third generation Nellore-Angus half-blood steers.

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Reciprocal differences among birth weights in F_1 *Bos indicus-Bos taurus* crosses, including a large calf sex difference, have been widely reported. Potential reciprocal differences among F_2 calves and for other traits are unknown. This analysis compared (males only) birth (BWT), weaning (WWT), yearling (YWT) and 15-mo weights among Nellore-Angus F_2 and F_3 steers (n = 372) born in 2009-2012. F_2 steers were sired by F_1 Nellore-sired (NA) or Angus-sired (AN) bulls out of NA and AN F_1 dams, giving rise to 4 reciprocal calf types (ANAN, ANNA, NAAN, NANA). F_3 steers resulted from F_2 NANA parents (bulls and dams). Weights were evaluated through mixed model procedures that included calf type, year, age of dam (AOD), and the regression on Julian birth date (for birth weight) or age of the calf (later weights) as fixed effects. Sire nested within calf type was included as a random effect. Year ($P < 0.01$) and covariate ($P < 0.05$) effects were observed for all weights. AOD affected WWT ($P < 0.01$) but not the other weights. Differences in calf type were seen for WWT ($P < 0.01$) and YWT ($P = 0.03$), with a trend for 15-mo weight ($P = 0.08$), but no differences in BWT. Table 006 shows the least squares means of all weights relative to calf type. The F_3 steers were lighter than the F_2 steers for weights except BWT, and the larger WWT of F_2 calves (from F_1 dams) over F_3 calves (from F_2 dams) carried across weights later in life. These data show that weights of F_2 and F_3 *Bos indicus-Bos taurus* steers may differ at later ages even though birth weights may not; this type of knowledge could improve weight prediction in growing cattle.

Keywords: Bos indicus, Nellore crosses, steers, growth, weight

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Table 007. Least squares means of birth weight (kg) in reciprocal F_2 Angus-Nellore calves across sex

Calf Breed Type	Female	Male
ANAN	27.7 ± 1.22	32.7 ± 1.21
ANNA	31.1 ± 0.75	33.8 ± 0.61
NAAN	33.8 ± 1.32	34.8 ± 1.05
NANA	34.3 ± 0.5	35.2 ± 0.49

007 Effects of breed type and sex on calf birth weight in reciprocal F2 Angus and Nellore Crosses.

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Crossing of *Bos indicus* and *Bos taurus* cattle is a common practice in the Gulf Coast Region of the United States. Large reciprocal differences in birth weight (BWT) in F_1 calves of *Bos indicus*, *Bos taurus* crosses have been reported from several studies. There have also been several studies conducted where BWT in F_2 calves was evaluated. Most studies have been conducted using American Brahman as the *Bos indicus* influence, and Angus or Hereford as the *Bos taurus* influence. An objective of the current study was to evaluate BWT in purebred Angus (A) as the *Bos taurus* breed, Nellore (N) as the *Bos indicus* breed, F_1 and all reciprocal types of F_2. BWT was evaluated with SAS using a PROC MIXED model including calf breed type, calf sex, calf breed type X sex interaction, and age class of dam nested within year as fixed effects; individual dam was included as a random effect. All fixed effects were significant ($P < .001$). Previous studies of the purebreds and F_1s showed similar results that were found in this study, including an unexpected sex difference in the purebred Nellore calves. A breed type by sex interaction ($P < .001$) was observed; among the different type of F_2s, the sex difference was 5.0 kg in the ANAN cross, but smaller in the ANNA and much smaller in the NAAN and NANA crosses. In mice (both *Mus* and *Peromyscus*), reciprocal differences in placentation and size at birth are associated with interactions between a gene (or genes) on the X chromosome and an imprinted autosomal gene (or genes). Phenotypic results from the current study, and from previous analyses of reciprocal differences in cattle birth weight, suggest that this mechanism may also be causing these reciprocal differences in *Bos indicus, Bos taurus* crosses.

Keywords: Birth weight, *Bos indicus*, *Bos taurus*

doi: 10.2527/ssasas2015-007

Table 008. Least squares means of hot carcass weight and longissimus muscle area of F_2 and F_3 Nellore-Angus steers.

	HCW (kg)		REA (cm^2)	
Cross	Estimate	SE	Estimate	SE
ANAN	385.9[a]	10.75	83.2[a]	2.26
ANNA	371.4[ab]	9.34	83.4[a]	1.74
NAAN	379.6[ab]	10.39	84.1[ab]	2.00
NANA	368.3[b]	9.66	84.0[a]	1.87
F3	367.3[b]	8.84	87.2[b]	1.48

008 Hot Carcass Weight and Longissimus Muscle Area in F_2 and F_3 Nellore-Angus Steers.

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Bos indicus-Bos taurus crossbred cattle are important to beef production in tropical and subtropical regions. Reciprocal F_1 *Bos indicus-Bos taurus* crosses are known to differ widely for birth weight, particularly across calf sex, but potential reciprocal differences in other crosses and for other traits have not been widely studied. The objectives of this study were to incorporate available production and management records including the type of cross to evaluate hot carcass weight (HCW) and longissimus muscle area (REA) among F_2 and F_3 Nellore-Angus steers. Animals were spring-born in 2009-2012. Reciprocal F_2 steers were produced from F_1 Angus-sired (AN) and Nellore-sired (NA) bulls bred to AN and NA F_1 cows, and are designated: ANAN (n = 22), ANNA (n =57), NAAN (n = 29) and NANA (n = 59). F_3 steers were from NANA x NANA matings (n = 183). Steers were used in a 42-d health trial in each of 4 yr before being transported to and finished in a commercial feedlot as a single pen, and harvested on a single day. Relationships among the carcass traits as well as the calf type were of interest, and mixed model procedures with common fixed and random effects were utilized, in addition to specific covariates for each trait where initial models included covariates of REA and adjusted fat thickness (AFT) for HCW, and covariates of weaning age (WA), AFT and HCW for REA. Table 008 provides least squares means for HCW and REA by type of cross. ANAN steers had HCW 18.6 kg heavier ($P < 0.01$) than F_3 steers and 17.6 kg heavier ($P < 0.05$) than NANA steers. Conversely, F3 steers had slightly larger REA than ANAN ($P < 0.05$), ANNA ($P < 0.01$), and NANA ($P < 0.05$) steers. These results show that steers of equal overall breed composition may differ for some carcass traits and that the crosses that produce them may help explain some variation.

Keywords: Nellore crosses, carcass weight, longissimus muscle area

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009 Identification of regions of the bovine genome associated with gray coat color in a Nellore_Angus cross population.

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The objective of this study was to identify the regions of the bovine genome associated with gray coat color in F_2 and F_3 Nellore–Angus crossbred cattle. Animals (n = 1,941) were classified into phenotypic color categories (i.e. red, black, gray, etc.) and genotypes on these cattle were obtained using the Infinium BovineSNP50v1 assay. Two genome-wide association analyses were conducted, one where phenotypically gray vs. not gray cattle were analyzed and another where cattle that were very light in color but had a reddish tinge were included as gray. Association analyses were based on a regression of the gray-not gray variable (0 and 1) on the genotypic values corresponding to homozygotes (values of 0 and 2) and heterozygotes (value of 1) at each SNP locus. *Melanocortin 1 receptor* (*MC1R*) genotypes were fitted as a fixed effect and the genomic relationship matrix was also incorporated into the model. A Bonferroni adjustment for multiple testing was applied to *P* values at $\alpha = 0.05$. There were no significant SNP detected near genes that cause gray in other species: *syntaxin-17* (*STX17*) on BTA8 and *premelanosome* (*PMEL*) on BTA5. Case (gray)–control analyses yielded 1 significant SNP marker, ARS-BFGL-NGS-119362, at BTA6: 68.1 Mb ($P_{genome} = 0.032$). When the reddish-tinged cattle were added to the gray cases, there were 5 significant markers on BTA6: 62.93 to 83.92 Mb, including the marker from the first analysis ($P_{genome} = 5.02 \times 10^{-6}$). Candidate genes in this region include *v-kit Hardy-Zuckerman 4 feline sarcoma viral oncogene homolog* (*KIT*), which is known to cause white spotting, *platelet-derived growth factor receptor alpha polypeptide* (*PDGFRA*), which was previously identified as a candidate gene for reddening of genotypically black (E^DE^+) cattle, and *corin serin pepsidase* (*CORIN*), known to cause a lighter coloration in mice.

Keywords: cattle, gray, GWAS

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010 Effect of hair coat shedding on herd performance in crossbred beef cattle.

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Heat stress in beef cattle located in the southern region may increase during the spring and summer months, especially in cattle that do not shed their winter hair coat efficiently. The objective of this study was to evaluate the variation in hair coat shedding and determine its effects on production traits in crossbred beef cattle. Fall-calving Angus crossbred cows and heifers (n = 200) were observed from March through September in 2012, 2013, and 2014. Once monthly, cows and heifers were evaluated for hair coat shedding using a 1 to 5 scale (1 = slick summer coat; 5 = full winter coat). Month of first shedding (MFS) was characterized by obtaining a hair coat shedding score of 3 (at least 50% shed) or less, and was observed in May, June, and July. Performance measurements included cow BW and BCS at weaning and pre-breeding and adjusted calf birth and weaning weights and were analyzed using PROC GLM of SAS. Reproductive measurements included artificial insemination and overall seasonal pregnancy rates and were analyzed using PROC FREQ of SAS. Cow BW at weaning and pre-breeding were greater ($P \leq 0.02$) for cows with MFS in May compared with June and July. Body condition scores at weaning tended ($P = 0.09$) to be greater for cows with MFS in May compared to July; however cow BCS at pre-breeding did not differ ($P = 0.15$) between cow MFS. Artificial insemination pregnancy rates tended ($P = 0.09$) to be the greatest in cows exhibiting MFS in May (54%), intermediate for June (48%), and lowest in July (37%); however, overall seasonal pregnancy rates did not differ ($P = 0.24$). Calf adjusted birth weight was greatest ($P < 0.01$) for cows exhibiting MFS in May compared with June and July. Cows who exhibited MFS in May tended ($P = 0.09$) to have the greatest adjusted calf weaning weights and adjusted calf weaning weights were intermediate for cows who exhibited MFS in July and lowest for those that exhibited MFS in June. Therefore, the earlier the month of first shedding their hair coat is exhibited, the greater the possibility of an increase in cow performance.

Keywords: Cattle, Hair coat shedding, Performance

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011 Effect of hair shedding on reproductive performance in Angus females.

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The objective of this study as to evaluate the effect of hair shedding on reproductive performance in purebred Angus females (n=204). Hair coat shedding data were collected every 30 d from March to July from 2013 to 2014. Dams were observed by two technicians for hair shedding and given a visual score of 1 to 5 with a score of 1 indicating completely shed, 2 = 25% shed, 3 = 50% shed, 4 = 75% shed and 5 = no shedding. The month of first shedding (MFS) was determined when a female reached an average shedding score of ≤3.5 for a given month. Cows were grouped as early shedding (ES) dams if their MFS was in March, April and May, and late shedding dams (LS) if in June and July for further analysis. Heifers and cows were managed to breed in the fall of each year. Heifers and cows were insemi-

nated via AI and then exposed to a bull (NS) for the remainder of the breeding season. Breeding season ranged from 55 to 56 d for cows and from 67 to 91 d in heifers. Data collected included pregnancy rate, calving date, type of breeding (AI or NS), and body condition score. Chi-square analysis was performed on the categorical data using the FREQ procedure of SAS. Shedding data were analyzed using the GLM procedure of SAS with calving date as the response variable with fixed effects of year, cow age, and MFS. There was no association found between pregnancy rates and MFS and ES and LS groups. For type of breeding, more LS (64.18%) females conceived via AI than ES (48.08%) females (P<0.05). Month of first shedding and ES and LS group effects were not significant for calving date. Previous work has suggested a relationship between early shedding of the winter hair coat by the dam and an increase in weight of the weaned calf. These data suggest no relationship between hair coat shedding and reproduction and the possible impact on calf age at weaning.

Keywords: beef cattle, hair shedding, reproduction
doi: 10.2527/ssasas2015-011

EXTENSION I

012 Evaluation of Antibiotic Metaphylactic Therapy for Receiving Calves at Risk for Bovine Respiratory Disease.

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Metaphylactic antimicrobial therapy is one strategy used to mitigate the risk of developing bovine respiratory disease (**BRD**) in newly received stocker cattle. The objective of this study was to evaluate the efficacy of single dose metaphylactic ceftiofur crystalline free acid ([**Excede**] 6.6 mg/kg BW; Pfizer Animal Health, Exaton, NY) or tilmicosin phosphate ([**Micotil**] 13.3 mg/kg BW; Elanco Animal Health, Indianapolis, IN) on measures of performance and animal health in receiving calves at risk for BRD. A total of 303 crossbred bull (n = 39) and steer (n = 264) calves (initial BW = 211 ± 12.6 kg) were received on 3 dates. Calves were stratified to pens by castrate status and body weight. Castrate status was equally distributed to treatments by assigning a similar number of bull and steer calves to each treatment pen (8 pens per block). Pens were then assigned randomly to single dose antimicrobial metaphylaxis: 1) Excede or 2) Micotil. No differences ($P \geq 0.23$) in ADG were observed between antibiotic metaphylactic treatments (1.2 vs 1.23 ± 0.04 kg/d, respectively). There was a trend ($P = 0.13$) for morbidity (calves treated at least once for BRD) rates to differ between metaphylactic treatments, with calves receiving Excede more likely to be treated for BRD (19.9 vs. 15.1%, respectively). Similarly, cattle receiving Excede required 80% more second ($P = 0.05$; 11.9 vs. 6.6%, respectively) and 400% more third ($P = 0.01$; 6.6 vs. 1.3%, respectively) antibiotic treatments. However, the average days from arrival until first ($P = 0.10$) and second ($P = 0.05$) treatments for BRD were increased for the Excede calves when compared to the Micotil calves. Metaphylactic treatment did not affect ($P \geq 0.16$) subsequent BRD treatment success (calves treated initially for BRD that did not require a second antibiotic treatment and calves treated with second antibiotic that did not require a third antibiotic treatment). The reduction in BRD morbidity rate for Micotil calves tended to result in fewer ($P = 0.07$; 0.38 vs. 0.23 antibiotic treatments for clinical BRD/calf, respectively) antibiotic treatments per calf and $5.62/calf less ($P \leq 0.05$) total antibiotic costs. Based on these results Micotil was more cost effective and efficacious as metaphylactic therapy for BRD in receiving calves at risk for disease.

Keywords: Bovine respiratory disease, Cattle, Metaphylactic therapy
doi: 10.2527/ssasas2015-012

013 Form of Se in free-choice mineral mix tends to affect individual ad libitum intake by grazing beef cows and affects cow and suckling calf blood Se levels.

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Previous controlled-mineral intake feeding trials have demonstrated that intake of 3 mg Se per day (the maximal FDA inclusion amount) from mineral mixes (85 g/d) that contained different sources of Se differentially affected Se assimilation by liver and blood Se concentrations of maturing beef heifers. To transfer this knowledge to formulation of free-choice mineral mixes, the amount of Se likely to be consumed by cows needs to be determined. However, individual intake of free-choice mineral mixes by cows managed under commercial forage-based cow-calf regimens has not been adequately characterized. The objectives of this study were to determine (1) individual ad libitum intake of mineral mix by beef cows managed under a year-long, fall-calving, forage-based production regimen and (2) if Se form in mineral mix affected blood Se levels of cows and suckling calves, and calf performance. Twenty-four late-gestation (6 to 8 mos) Angus-cross cows (3.5 ± 0.9 yr; BW = 607 ± 70 kg) were assigned (n = 8) to a mineral supplement treatment (TRT) containing 35 ppm Se as either inorganic (ISe; sodium selenite), organic (OSe; SEL-PLEX), or a 1:1 combination of ISe:OSe (MIX). Cows commonly grazed a 10.1 ha predominately tall fescue pasture and had individual ad libitum access to TRT us-

ing in-pasture Calan gates. Cows calved from August to November and calves had common ad libitum access to creep feed and a mineral supplement that lacked Se. Cow jugular blood was taken at 28-d intervals (13 periods). Calf blood was taken within 48 h of birth and then at same time period as dam's until weaning. Mean individual cow mineral mix intake was affected by Period ($P < 0.001$) and tended to be affected ($P = 0.096$) by cow TRT (90 ± 37, 87 ± 0.34, 64 ± 21 g/d, respectively for ISe, OSe, and MIX). Mean individual cow Se intakes also tended to differ by TRT ($P = 0.078$) and were 3.00 ± 1.23, 3.02 ± 1.20, and 2.15 ± 0.71 mg/d, respectively. Mean cow blood Se levels were affected ($P < 0.001$) by Period and TRT and were 0.27 ± 0.01, 0.20 ± 0.01, and 0.22 ± 0.01 µg/mL, respectively. Calf blood Se was correlated ($P < 0.001$) with cow blood Se and affected ($P< 0.002$) by Period and cow Se TRT and was 0.10 ± 0.01, 0.23 ± 0.01, and 0.16 ± 0.01 µg/mL, respectively.

Keywords: Free-choice minerals, Selenium, cow-calf
doi: 10.2527/ssasas2015-013

014 Development, implementation and evaluation of an artificial insemination certification course.

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Artificial insemination (AI) is beneficial in cattle production but remains underutilized. Impediments to adoption of AI include producers' lack of training for insemination technique. An AI certification course was initiated with the objective of partially alleviating the lack of training opportunities. The initial design of the course was a 3 d classroom and hands-on training. It was evaluated by UT Extension county agents (n=25) who indicated that the training could be accomplished in less time and that the class size should be limited to a ratio of 1 student per 3 practice cows. The initial course template was modified to a final 2 d design that included classroom and laboratory instruction with three practice sessions in non-pregnant heifers and cows (n = 36). Classes (n = 12) were limited to 12 students (n = 144) who were required to demonstrate sufficient knowledge transfer of classroom training via written exam and to exhibit proficiency for semen handling and AI technique before certification was awarded. Students completed course evaluations, rating their experience in each classroom and laboratory session and overall experience as Excellent (1), Good (2), Fair (3) or Poor (4). Course instructors' knowledge of the subject matter was rated on the same scale. Students were asked to rate their ability to properly thaw and load semen and pass the AI rod through the cervix on a Likert scale of 1 (confident) to 10 (not confident). Classroom and laboratory evaluation results are depicted in Table 014. Instructors' knowledge of the subject matter ranking averaged 1.03 ± 0.17. Student confidence in semen handling and AI technique averaged 1.95 ± 1.2 and 4.11 ± 2.2, respectively. These results indicate that the course was successful in training students to successfully inseminate cows and heifers and to understand the factors that influence fertility to AI.

Table 014. Evaluation results for rating classroom and lab sections.

Topic	Exc.	Good	Fair	Poor	Mean (SD)
Anatomy & Physiology	128	15	2	0	1.13 (0.38)
Estrous Synchronization	106	32	6	0	1.31 (0.55)
Insemination Technique	129	16	0	0	1.11 (0.31)
Health & Nutrition	88	36	6	3	1.43 (0.69)
Reproductive Tract Lab	124	9	2	0	1.10 (0.34)
Semen Handling Lab	133	11	0	0	1.08 (0.27)
Live Cow Labs (three per course)	118	15	2	0	1.14 (0.39)
Overall Experience	116	16	1	0	1.14 (0.36)

Table 015. U.S. Beef Cow-Calf Long-Term Projections

	2015	2016	2017	2018	2019
Feeder Calf Revenue Per Brood Cow, 525 *lbs.*, *$/hd.*	$1,028.41	$969.28	$882.20	$830.04	$787.57
Calf Production Costs Per Brood Cow, *$/hd.*	$750.00	$765.00	$780.30	$795.91	$811.82
Profit Per Brood Cow, *$/hd.*	$278.41	$204.28	$101.90	$34.14	-$24.26

Keywords: Cattle, Artificial Insemination, Training
doi: 10.2527/ssasas2015-014

015 The Economics of Herd Expansion.

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Making a sustainable profit with a cow-calf enterprise requires prior planning and management. Over the next 10 years, cattle ranchers will face many uncertainties regarding profitability. The expanding U.S. cowherd, expanding alternative meat substitutes, a lackluster domestic economy, weaker foreign economies, strengthening U.S. Dollar, vagaries of the weather, etc. will adversely impact cow-calf profitability. Therefore, these factors should weigh heavily on the decisions producers make when retaining heifers which will impact their ranches for the next decade. An example of how the cow-calf industry's economic environment might unfold over the next ten years will be presented based on baseline price projections from The Food and Agriculture Policy Institute (FAPRI) and the United States Department of Agriculture (USDA). Both publish a set of 10-year baseline cattle projections for production, inventory, and price. These baseline projections are used to create prices, revenues, costs, and profits for the U.S. cow-calf industry. The projections provide a guide to help cow-calf producers develop a plan when making important long-term decisions for their businesses. An analysis of the long-run cow-calf profit and loss projections for U.S. beef cow-calf herds is presented in Table 015. The years 2015-2018 are projected to be years with profit poten-

tial for cow-calf producers as prices continue to be strong. After 2018, decreases in cattle prices from the projected expansion of the national beef cowherd and increases in cost of production are projected to result in losses for beef cow-calf producers.

Keywords: Cow-Calf, Expansion, Market Outlook
doi: 10.2527/ssasas2015-015

016 Impacts of Western North Carolina Grazing Clinics on Producer Pasture Management.

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In 2014, the Western North Carolina (NC) Grazing Clinics were delivered in four locations over eight weeks with the intent of developing farm-specific grazing plans for participant producers and increasing the adoption of critical pastureland conservation practices. The Clinics incorporated hands-on, experiential learning with some lecture and on-farm demonstrations. Instructors were drawn from the NC Cooperative Extension Service, the NC Department of Agriculture & Consumer Services Agronomic Division, local Soil and Water Conservation Districts, and the United States Department of Agriculture Natural Resources Conservation Service. Local representatives from each of the aforementioned agencies attended each session in order to form an interagency "team" of personnel to assist producers during the Clinics. The curriculum of the schools focused on helping participants to understand the issues of grazing intensity, rotational livestock management technique, forage accumulation, pasture utilization efficiency, and economic principles supporting these management aspects. Primary program effort was put on assisting producers in the development of farm-specific grazing conservation plans formulated to meet the needs of their unique operation. During each session, participants were given a lecture, then guided through a hands-on exercise to help them to understand the presented concept for their own farms, and finally tasked with completing a portion of their grazing plan. On-farm demonstration of technologies were included as the focus of the final session at each location. One year after the Grazing Clinics concluded, a sample of participants were emailed a survey instrument seeking to quantify the impacts of the Clinics model. Respondents (n = 64) reported developing a grazing plan during the Grazing Clinics, and 88% responded that they had implemented all or part of that plan. 96% of respondents reported adopting at least one grazing management activity that they perceived to be directly linked to their attendance of the Grazing Clinics. The results appear to indicate that the 2014 Western NC Grazing Clinics yielded four major products: 1) farm-specific grazing plans outlining conservation practices in which farmers have high personal investment and intent to implement; 2) farmer adoption of the most critical aspects of the prescribed grazing practice and its supporting conservation practices; 3) improved farmer understanding of and comfort with key pasture management technologies; and 4) establishment of a collaborative interagency support network for pasture producers. Recommendations for Clinic repetition include adaptable curriculum development, strengthening institutional supports, and creating opportunity for knowledge diffusion.

Keywords: Interagency Collaboration, Producer educational methods, Grazing plan adoption
doi: 10.2527/ssasas2015-016

017 Comparing post test scores for an animal handling and control workshop conducted two consecutive years.

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Difficult decisions weigh often on the shoulders of animal control officers. Prior research demonstrated many of these officers do not have the animal health and wellbeing knowledge required for rendering welfare judgements, specifically on farm animals. An animal handling and welfare workshop was conducted for Arkansas animal control officers to demonstrate handling and health for livestock. There were two objectives: 1) To determine health and wellbeing knowledge gained for farm animals and 2) Compare results of posttests from current year (2015) and previous year (2014). For both yrs, there were 5 species of livestock presented: dairy and beef cattle, horse, goats, and sheep. Each species session was taught by faculty from the University of Arkansas, Division of Agriculture's Department of Animal Science. All sessions included healthy behavior, unhealthy symptoms, proper movement, and handling for each species. Eleven animal control officers participated in the 3 h workshop in 2015. To determine knowledge prior to the workshop, a pre-test was administered. A duplicate post-test was given at the end of the workshop. Each test consisted of photos of each species and one question: "What are things you might look for in a (species) that would indicate that it is not in good health?" Additionally, participants were asked to define the flight zone and point of balance for each animal. In the dairy species, participants increased their pre-test/posttest scores 14% ($P = 0.58$); knowledge was increased 300% in beef cattle ($P = 0.01$); knowledge gained increased for horses by 167% ($P = 0.02$); goats increased in pre-test/posttest knowledge by 200% ($P = 0.01$) and sheep 33% ($P = 0.34$). There was an increase in knowledge gained defining flight zone (700%, $P = 0.01$) and point of balance (530%, $P = 0.04$). Overall, participants showed a 150% increase ($P = 0.01$) in livestock knowledge. When compared to the previous year, there was a 35% increase in posttest scoring ($P = 0.31$).

In an effort to increase knowledge gained, faculty should pursue areas to improve in subject area delivery and seek feedback from participants on areas to improve.

Keywords: animal welfare, control officers, farm animals

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018 Cooperative Extension Programming for Diverse Clientele in the Virginia Swine Industry.

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From 1987 to 2002, hog and pig inventory in Virginia was 384,800 ± 11,237 annually, but there was a 77% decrease in farm number (3,711 to 855), reflecting industry consolidation and a change to large, vertically-integrated production systems. Today, Smithfield Foods, Inc., the world's largest pork producer and processor, maintains in Virginia corporate headquarters, company-owned farms, production contracts with growers, a feed mill, and a harvest facility processing 10,400 hogs daily. The main continuing education program for this mature segment of the industry remains the Virginia Pork Industry Conference, and the 49th annual event occurs in 2016. Although large corporate-type entities will continue to dominate the Virginia pork industry, there was a 48% increase in the number of farms from 2002 to 2012 (855 to 1,265), due largely to an increase in the number of small farms producing pork for consumers who prefer that their meat be from hogs raised locally in less-intensive systems that they perceive to be more welfare-friendly. Many pig farmers entering the industry seek educational information from county Extension offices, and swine specialists from Virginia Tech. To serve this growing clientele, Small-scale and Niche Market Pork Production bulletins addressing various topics are electronically mailed to over 150 farmers every two months. Moreover, the Small-Scale and Niche Market Pork Production Conference was organized with the fourth annual event occurring in 2015. Sponsors include Virginia Cooperative Extension, Virginia Pork Council, Inc., and the Virginia Agricultural Council. Attendees receive education from reputable speakers on a variety of topics such as pork and transportation quality assurance, emerging diseases such as epidemic diarrhea virus (PEDV), certifications and labels available to enhance marketing of niche pork, genetic principles and breeds of swine, nutrition, and reproductive management. The conference has been attended by 43.0 ± 4.7 persons/year and farmers (n = 22) completing a post-conference evaluation indicated they had 21.1 ± 4.4 sows and a total inventory of 133.9 ± 40.7 head. Scores (1=Poor, 2=Fair, 3=Good, and 4=Excellent) for overall assessment of conference was 3.4, 3.5, and 3.8 for 2012, 2013, and 2014, respectively. The diverse nature of the swine industry requires specific programming tailored to the large producers of commodity pork as well as to small-scale and niche market pig farmers.

Keywords: niche pork Extension

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019 Improving Enterprise Outcomes and Increasing Minority Participation within the Meat Goat Industry through Outreach Activities in the Southeast.

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Meat goat production has become an attractive industry among limited-resource and lifestyle operators. A persistent problem meat goat managers have faced is the lack of research-based reference information to use in decision-making when starting or assessing operations. A series of events were conducted by the Alabama Cooperative Extension System (ACES), Tennessee State University agricultural research institute (TSU) and the MS Meat Goat Producers Cooperative to help potential and active managers better understand meat goat production and devise plans to enhance the chances of enterprise success. One objective was to increase awareness among minority groups of potential opportunities in meat goat production. Over two years, three workshops (one each in AL, TN, and MS) and participation in various industry programs provided the venues for engagement with active and prospective producers. Primary focal points were internal parasitism, general herd health, and genetic management. Attendees were provided the opportunity to complete a program evaluation questionnaire. Program evaluations were provided by 134 men and 127 women. Respondents represented 11 states, with most residing in AL (n = 105), MS (n = 81) and GA (n = 30). Minorities represented 48% of respondents. Programs were rated 'excellent' by 217 respondents and 'good' by 24 respondents. Three quarters of respondents identified themselves as goat producers among 5 production options. Most indicated goats only (n = 151) whereas some (n = 44) recorded goats along with cattle, sheep, timber, and(or) other production interests. Major reasons for raising meat goats were slaughter (54%), breeding stock (37%), brush control (20%), and fun or hobby (13%). Producers that previously attended educational programs or received educational materials on small ruminants from ACES or TSU were asked to characterize some outcomes. Of 140 respondents, 57% indicated they began raising goats. Production efficiency improvement ranged from

no change (17% of responses) to greater that 20% increase (18%). Herd health improvement based on reduced animal illness and death ranged from no change (15% of responses) to greater that 20% increase (29%). Enterprise profitability ranged from no change (16% of responses) to greater that 20% increase (21%). Breed selection was affected or changed for 43% of past contacts. Performance recording was started or modified for 31% of past contacts. Modified within-herd selection and culling procedures were modified by 39% of previous contacts. Program participants represented diverse demographics and management objectives. Producers viewed past participation as generally beneficial.

Keywords: Meat goats, Producer education, Minorities
doi: 10.2527/ssasas2015-019

020 Southern Section Extension Forum: strengthening Extension programs across the Southeast.

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The Southern Section Extension Forum was held in Ardmore, OK in August 2015. The objective of this two-day conference was for state and regional area Extension specialists to network with industry and producers to discuss current issues related to the development and delivery of forage-livestock programming within the southeastern region. This Forum was well attended by 49 total participants from Alabama, Arkansas, Florida, Georgia, Kentucky, Mississippi, North Carolina, Oklahoma, South Carolina, and Texas. Topics included preparedness when working with news reporters, marketing programs, program evaluation, and quantifying program impact. There were also a series of panel discussions focused on new agent training, industry perspectives on Extension programming, and funding challenges/opportunities. With all 24 survey responses indicating yes or maybe, participants felt the information presented would be useful in Extension programming. Participants were asked to rate topics and speakers on a Likert-type scale, where 1= poor and 5 = excellent. Participants rated the talks on interviews with media and marketing programs and services with highest topic scores, both at 4.38 ± 0.72. The lowest score of all topics was 3.52. Participants indicated that the program length of 2 half-day sessions with an optional tour was ideal for the program (19 of 24 responses), and that the program should be repeated every 2 or 3 years (11 and 10 responses, respectively). Presentations were the preferred format for content delivery, and ranked first by 10 out of 23 responses; however open response indicated a desire for more panel and open discussion. Program attendee demographics indicated that those in attendance were primarily focused on beef cattle (19), followed by forage (8), small ruminants (4), equine (3), dairy (2), and swine (1). The majority of attendees (58%) focused on general management and nutrition. The time in current position for attendees ranged from 2 months to 30 years, with an average of 8 years, which helped facilitate high-quality group discussion across varying levels of experience. Attendees indicated a planned adoption or increased adoption of social media in Extension programs. Overall the forum was well received and considered a success by attendees.

Keywords: Extension, News media, Publicizing, Extension, Extension impact, Extension funding
doi: 10.2527/ssasas2015-020

EXTENSION II

021 Assessment of a Beef Cattle Management Website for Extending the Reach of Extension Information in Alabama.

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It is estimated that 70% of US farms and ranches now have access to the internet (NASS, 2015), and 40% are livestock producers that regularly use computers for business purposes. Informational websites and other web-based platforms are ways to help deliver research-based beef cattle management information to clientele. In August 2014, the Alabama Cooperative Extension Beef Systems program launched a beef cattle management website (www.alabamabeefsystems.com) for housing publications, decision tools, and current events related to a variety of management topics including forages, nutrition, health, reproduction, and economics. Following one-year of promotion and use in Extension programs, website metrics were assessed to determine overall use, areas of interest among users, and trends for enhancing website use by stakeholders. During the first year of use, there were 6,007 site visits, with an average visit duration of 6 min and 34 sec, and a median duration of 1 min and 10 sec. The number of visits to the website generally followed a linear trend from August 2014 to August 2015, with an increasing number of visitors across this time period. Within the website, the most visited pages included the main home page and breakout topics related to fencing, the Alabama commodity feed list, forages, and nutrition. The majority of website traffic was direct traffic to the website (48%), while 32% were referred through the main Alabama Extension page. The remaining site visits were primarily from search engines using the words ACES, beef, Alabama, feed, cattle, and commodities. Increased web traffic was observed on the day

of extension programs where the site was discussed in detail. Publications and upcoming events listed on the website were also promoted through the use of social media tools such as Facebook and Twitter. Links to the Beef Systems website were incorporated into social media posts using shortened URLs which provided tracking metrics. When links were posted to these web outlets, the average number of publication views on the website increased (175 views following posts vs. 74 average views for similar resources). These results suggest that stacking the use of web-based tools may help increase the reach of online beef cattle management information. Short-term web-use metrics enable Extension professionals to gather baseline data for reporting information usefulness and identify areas for improvement when creating web-based resources.

Keywords: Websites, beef cattle, Extension

doi: 10.2527/ssasas2015-021

022 Beef Cattle Programming Across State Lines: The 7th Annual Deep South Stocker Conference.

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The seventh annual Deep South Stocker Conference was held in Montgomery, AL on August 6 and 7, 2015. This conference is coordinated annually as a joint effort among state beef cattle specialists affiliated with the Alabama Cooperative Extension System, University of Georgia Extension, and the Mississippi State University Extension Service. Each year the conference rotates among these states. The overall goal of this program is to provide a timely educational update to stocker cattle producers within the region prior to the time of fall-purchasing calves. The 2015 conference was held using a two-day format, consisting of a welcome meal and program at the Alabama Cattlemen's Association on August 6, followed by a one-day educational conference held at Auburn University at Montgomery on August 7. The one-day program consisted of two keynote speakers and a series of panel discussions focused on the topics of forages, nutrition, economics, and health management in stocker operations. Breakout panel discussions were facilitated by extension agents, specialists, and producers. Panelists included researchers, Extension specialists, graduate students, and industry partners. Participants also had the opportunity to interact with 25 industry partners representing various commercial segments of the beef industry during extended breaks and meals. A survey was conducted at the end of the workshop using a clicker-based response system (Turning Technologies, LLC). Meeting attendees were from AL, FL, GA, MS, TN, SC, TX, and CA. Survey participants (n = 39) had an average of 10 to 12 years of experience in the beef cattle industry, and a weighted average of 5,048 acres were impacted by the information presented at this meeting. Overall, attendees indicated improved knowledge gain (19% greatly improved and 61% moderately improved) following the conference. The quality of the educational content presented was well-received by participants as noted by a rating of good to excellent on a Likert-type scale (mean rating = 3.75; where 1=poor and 4 = excellent, respectively). 90% of the respondents indicated that the information would be useful in their operation, and that they intended to implement management changes in their operations. Results from this conference illustrate that multi-state programs are an excellent way to interface with Extension, industry, commodity groups, and stakeholders to deliver educational information on a regional basis.

Keywords: Beef cattle, Extension, conference, stocker cattle

doi: 10.2527/ssasas2015-022

023 Beef ambassador programming: A case for coming alongside the beef community to develop agvocacy and leadership skills in youth.

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As consumers are routinely bombarded with anti-beef and agriculture messages, the importance of equipping youth with agvocacy and leadership skills has never been more important to the future of agriculture. An Alabama Beef Ambassador Program (ABAP) was established within the Department of Animal Sciences in partnership with the Alabama Cattlewomen's and Cattlemen's Associations to equip youth with the ability to be effective spokespersons and leaders for the beef community. ABAP's goal is to utilize beef ambassadors to tell the beef production story to consumers and youth through promotion, education, media and online environments. Prior to a state level competition, a workshop was held for youth ages 9-20 to enable participants capability to inform consumers and other youth about beef nutrition, food safety, the economic value and stewardship practices of the beef industry. The day long workshop included educational sessions on: developing an intentional leadership advocacy mindset, the need for beef ambassadors, overview of ABAP contest, where to find resources, general beef knowledge and overview of beef industry, beef nutrition and diet/health, consumer promotion concepts and exercises, education and outreach plans, social media strategies, beef community issues and responses, interviewing skills – media training, and beef harvesting and grading. As an outcome of the workshop, post-workshop mentorship and a state contest, Beef Ambassadors in train-

ing were enabled to go into classrooms, daycares, after school programs and youth organization activities where they made presentations about their personal experiences with beef and the beef industry, including industry messages on nutrition, animal welfare, environment and other key topics. ABAP participants evaluated the workshop on a scale of 1 (poor) to 5 (great) in several areas: content covered = 4.8; knowledge of facilitators= 4.8; teaching approaches= 4.7; workshop location and environment = 4.8; and would they recommend to others = 4.6. Written comments about the workshop and what the participants felt they gained most from the workshop were highly positive. Based on this feedback, the expected learning outcomes of the workshop were achieved and strongly support the continued investment in and development of beef ambassador programming locally, regionally and nationally.

Keywords: beef issues, advocacy, leadership programming
doi: 10.2527/ssasas2015-023

024 North Carolina Women Cattle Producers' Educational Needs and Sources of Information.

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Extension educators regularly conduct needs assessment surveys to identify their clients' educational needs and preferences. This study, a descriptive design, assessed the needs of North Carolina women cattle producers in order to determine their educational needs. The study also sought to determine the preferred method of educational delivery from on-farm workshops or via the internet along with the times that best suit their schedules for optimal learning. A purposive sample was taken from a master list of the NC Leadership & Cattle Handling for Women Producers program. One-hundred nineteen participants responded to the questionnaire, for a response rate of 60.7%. The respondents relied on many sources of information on beef production and management problems. Sources of information used by respondents included; 1) other cattle producers (78.2%, n=93), 2) Extension personnel (69.7%, n=83) and 3) their veterinarian (65.5%, n=78). Most respondent's used the internet (61.3%, n=73) to find information regarding beef production and management questions. Table 024 summarizes the usefulness of various sources of assistance. Overall, respondents stated that Extension or a university source of information (67.5%, *n*=77) was "very useful". Veterinarians also classified as "very useful" (65.7%, *n*=69). The USDA Natural Resource Conservation Service and local Soil & Water Conservation District staff (37.6%, *n*=38) were also "very useful". Although the Extension or University was generally classified as "very useful", some respondents stated the organization was "limited" to "not useful" (4.4%, *n*=5). The preferred program delivery method of the women cattle producers within the next two years is a seminar or workshop (89.9%, n=107), on-farm demonstrations (82.4%, n=98), internet based learning (53.8%, n=64) and presentations during a regular meeting or organization (42.0%, n=50). The top five subject matter training needs are as follows: maintaining herd health (64.7%, n=77), cattle nutrition (64.7%, n=77), increasing productivity/fertility of cattle (59.7%, n=71), pasture management (57.1%, n=68) and genetic selection (54.6%, n=65).

Table 024. Sources of Assistance Used By Respondents and Their Usefulness.

Source of Assistance	Not Useful %	Limited Usefull-ness %	Somewhat Useful %	Very Useful %	N/A %
Extension or University	1.8	2.6	15.8	67.5	12.3
USDA Organizations (e.g. NRCS, Soil & Water, FSA)	2.0	4.0	29.7	37.6	26.7
Commodity Organization	0.0	7.6	35.0	31.0	25.0
Farm Supply Store	0.0	15.3	37.8	16.3	30.6
Veterinarian	1.0	3.8	18.1	65.7	11.4
Private Consultant	0.0	9.7	32.3	17.2	40.9
Input Supplier	1.3	1.3	10.3	10.3	76.9

Keywords: Beef Cattle, Women, Educational Needs
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025 NC Cattle Industry Assessment Program.

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North Carolina recently implemented a supplementary cattle assessment to improve funding available for cattle-related programs in the state. North Carolina has general legislation that allows commodity groups to develop a voluntary assessment program that must be approved by 2/3 of voting producers for an initial 3 years, and then reapproved by a 2/3 vote each 6 years thereafter. Funds are assessed at the point of sale and producers may request a refund if they don't want to support the program. In 2007 the referendum asked producers for $1/head which was denied with 52% in favor (total of 766 votes). Producer feedback suggested the failure was due to a lack of structure in the way funds would be spent. In 2009, the referendum was conducted again, with a stated plan of spending at least 10% of funds in these five areas; Youth Programs, Producer Education, Applied Research, Promotion and Issues Management, with the balance spent in any of those 5 areas. The referendum was approved with 73% positive votes (total of 1147 votes). During the first three years, total annual revenue was $337,058±27,597 (mean±SD). Funds used annually by the NC Cattlemen's Association (NCCA) included $44,270±10,740 for Research, $49,256±9568 for Producer Education, $41,857±5330 for Youth, $35,320±8,333 for Issues

Management, $16,557±6885 for Promotion, and $343±132 for refunds. After the first three years, the continuation vote was 92% positive (total of 795 votes). A grant program was developed to provide funding for Research, Producer Education and Youth projects at NC State University. Projects are limited to $7,000 per year, and proposals are evaluated by committees of producers from across the state. Evaluation committees make recommendations to the NCCA Executive Committee which makes final funding decisions. During the first 5 years of the program faculty requested $503,289 and received $381,510 in total funding. Projects were categorized by discipline, and total funding obtained was $7,399 for animal health (28% success rate), $68,363 for Forages (79% success rate), $32,212 for Genetics (83% success rate), $48,651 for Management (92% success rate), $60,166 for Nutrition (77% success rate), $28,399 for general producer outreach (100% success rate), $80,978 for Physiology (76% success rate), and $55,402 for Youth Programs (100% success rate). The NC Cattle Industry Assessment Program has provided vital funding for continuing applied beef cattle programs, and has strengthened the working relationship between NC State University and the NC Beef Industry.

Keywords: Funding, Cattle Industry Assessment
doi: 10.2527/ssasas2015-025

GRADUATE STUDENT COMPETITION MS I

026 Effect of doeling traits at weaning on doe survival and reproductive rates through their first production year in the southeastern United States.

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Weaned doelings (n = 416) across seven years were evaluated to determine if weaning type (single or multiple), weaning weight ratio (WWR) and breed (Boer, Kiko, Spanish, Myotonic, Boer-cross) influenced subsequent survival and reproduction. Ratios were classified as low (<87; LL), moderately low (87-99; ML), moderately high (100-112; MH) and high (>113; HH). Post-weaning doeling data through the weaning of their first litters were assessed. Survivability to first breeding (18 months) and kidding (24 months) was lower ($P < 0.01$) for Boer (43.5 ± 10.4%; 18.7 ± 8.7 %) than Boer-cross (88.1 ± 4.2%; 64.1 ± 11.3%), Kiko (90.7 ± 3.8%; 76.3 ± 9.1%), Myotonic (85.1 ± 7.9%; 86.2 ± 8.5%) and Spanish (88.9 ± 4.3%; 83.3 ± 7.2%) does. Survivability to kidding also differed ($P < 0.05$) between Boer-cross and Spanish. Survivability of Boer (37.3 ± 7.9%) was lower ($P < 0.01$) than Boer-cross (74.8 ± 5.0%), Kiko (79.1 ± 4.9%) and Spanish (76.7 ± 5.3%) but did not differ from Myotonic (62.3 ± 12.0) does at first weaning (27 months). Weaning type and WWR only affected survivability at kidding age. Single does had greater ($P < 0.05$) survivability (73.1 ± 9.7%) than multiple (61.9 ± 1%) and LL (45.0 ± 11.8%) had lower ($P < 0.05$) survivability than ML (68.5 ± 10.6%), MH (75.3 ± 9.2%) and HH (71.4 ± 10.2%). Kidding rate (KR) and weaning rate (WR) were assessed on the population remaining at first breeding. Boer had lower ($P < 0.05$) KR (40.0 ± 16.6%) than Kiko (83.6 ± 8.1%), Myotonic (96.2 ± 3.7%) and Spanish (87.9 ± 6.5%) but tended to differ ($P = 0.06$) from Boer-cross. Kidding rate of LL (67.6 ± 13.0%) was lower ($P < 0.05$) than MH (87.7 ± 6.6%) but tended to differ ($P = 0.08$) from HH (84.7 ± 8.0%). Boer had lower ($P < 0.05$) WR (27.6 ± 11.1%) than Kiko (71.2 ± 8.4%) and Spanish (71.71 ± 8.5%) but did not differ from Boer-cross (53.7 ± 10.0%). Boer tended to differ ($P = 0.07$) from Myotonic (75.4 ± 13.1) at first weaning. Low ratio does (41.1 ± 10.3%) had lower ($P < 0.05$) WR than ML (64.0 ± 10.0%), MH (68.7 ± 9.2%) and HH (67.1 ± 9.7%). There was no influence of weaning type on reproductive rates. Survival was influenced primarily by breed. Reproduction was affected by breed and WWR.

Keywords: meat goats, survivability, reproductive rate
doi: 10.2527/ssasas2015-026

027 Effect of level of Pongamia seedcake on nutrient utilization in cattle consuming forage.

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Pongamia is a tropical oilseed that, after oil extraction, can be used as a feedstuff. Pongamia seedcake (PSC) contains anti-quality factors including pongamol and karanjin that are partially removed with different oil extraction methods. Five ruminally cannulated steers (362 kg BW) were used in a 5×5 Latin square to determine effects of solvent extracted (SKC) or expeller pressed (EKC) PSC on nutrient utilization. Treatments consisted of a non-supplemented control (NOSUPP) and four supplements, each providing 100 mg N/kg BW. Supplements provided 0% of the N as PSC (0PSC), 40% of the N as SKC (40SKC), 20% of the N as EKC (20EKC), or 40% of the N as EKC (40EKC). Supplements were dosed ruminally prior to feeding hay (6.2% CP). Periods were 14 d, 8 d adaptation, 5 d to determine intake and digestion, and 1 d to quantify ruminal fermentation. During the project, 3 steers on 40EKC were removed due to anorexia (≤ 1.30 kg/d intake), attributed to treatment. Forage (6.12 kg/d) and total OM intake (6.70 kg/d) were greatest with 0PSC ($P<0.01$). Total OM intake with 40SKC, 20EKC, or NOSUPP (5.49, 5.30, and 5.25 kg/d, respectively) were similar ($P=0.44$); OM intake was lowest with 40EKC (4.13 kg/d; $P<0.05$; n=2). Supplementation did not increase total tract digestion ($P\geq0.79$). All steers retained N, but 0PSC retained (34.7 g/d) more N than all other treatments ($P<0.05$), most likely due to the dif-

ferences in N intake and energy availability. Steers receiving NOSUPP retained the least amount of N (7.0 g/d) which was not different (P=0.17) from 40EKC (15.5 g/d). Steers fed 20EKC and 40SKC retained similar amounts of N (22.9 and 19.7 g/d, respectively; P>0.05) and were similar to 40EKC, but greater than NOSUPP (P=0.01). Of PSC supplemented steers, provision of 40SKC resulted in the lowest apparent digestion of both pongamol and karanjin (219 and 393 mg/d, respectively), intermediate was 20EKC (435 and 678 mg/d, respectively) and the greatest was 40EKC (789 and 1132 mg/d, respectively). Based on this study, 40EKC does not seem to be a viable option as a protein supplement for cattle, while 40SKC and 20EKC could potentially be utilized as protein supplements. Solvent extraction resulted in lower digestion of anti-quality factors than expeller pressing, and can be included at higher levels in supplements.

Keywords: Pongamia seedcake, protein supplementation, nutrient utilization

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028 Decreasing the frequency and rate of wet brewers grains supplementation did not impact growth but reduced humoral immune response of preconditioning beef heifers.

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This study evaluated growth and humoral immunity of preconditioning beef heifers supplemented wet brewers grains (WBG) at two supplementation rates and frequencies. On d 0, Angus heifers (n = 36; 213 ± 2 kg of BW; 254 ± 7 d of age) were stratified by BW and age, and randomly assigned to 1 of 12 feedlot pens (3 heifers/pen). Treatments were randomly assigned to pens, in a 2 x 2 factorial design, and consisted of heifers provided ground tall fescue hay *ad libitum* (55% TDN, 12% CP of DM) and supplemented with WBG (75% TDN, 36% CP of DM) either daily (**7x**) or 3 times weekly (**3x**; Monday, Wednesday and Friday) at **0.5** or **1.0%** of BW (DM basis) for 42 d. Heifers were vaccinated with Bovi Shield Gold One Shot and Ultrabac 7 on d 24 and Bovi Shield Gold 5 and Ultrabac 7 (Zoetis Animal Health) on d 28. On d 0 and 42, BW was obtained after 12-h of feed and water withdrawal, whereas blood samples from jugular vein were collected to determine serum titers against infectious rhinotracheitis (IBR), bovine viral diarrhea virus (BVDV) type 1-b and 2. Effects of frequency x day were detected (P < 0.0001) for hay and total DMI. Heifers supplemented with WBG 3x weekly had less hay DMI (2.6 vs. 3.2 ± 0.16 kg/d; P < 0.0001), but greater total DMI (5.6 vs. 3.8 ± 0.16 kg/d; P < 0.0001) than 7x heifers on days that all heifers received WBG supplementation. However, overall hay and total DMI was not affected ($P \geq 0.40$) by supplementation frequency. Thus, effects of frequency x rate or frequency were not detected for ADG, BW and G:F from d 0 to 42 ($P \geq 0.29$). Serum BVDV-1b titers were greater (P = 0.04) for 7x vs. 3x heifers on d 42 (4.2 vs. 3.3 ± 0.28 $\log_2$), whereas serum titers against BVDV-2 and IBR were greater for heifers fed WBG at 1.0 vs. 0.5% of BW (7.6 vs. 6.7 and 3.3 vs. 2.8 ± 0.19 $\log_2$, respectively). Therefore, decreasing WBG supplementation rate from 1.0 to 0.5% of BW or supplementation frequency from daily to 3 times weekly did not affect growth performance, but impaired humoral immune response of beef heifers after a 42-d preconditioning period.

Keywords: Heifers, humoral immune, frequency, preconditioning rate, supplementation

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029 Effect of level of Pongamia seedcake on nutrient utilization in cattle consuming forage.

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Pongamia is a tropical oilseed that, after oil extraction, can be used as a feedstuff. Pongamia seedcake (PSC) contains anti-quality factors including pongamol and karanjin that are partially removed with different oil extraction methods. Five ruminally cannulated steers (362 kg BW) were used in a 5×5 Latin square to determine effects of solvent extracted (SKC) or expeller pressed (EKC) PSC on nutrient utilization. Treatments consisted of a non-supplemented control (NOSUPP) and four supplements, each providing 100 mg N/kg BW. Supplements provided 0% of the N as PSC (0PSC), 40% of the N as SKC (40SKC), 20% of the N as EKC (20EKC), or 40% of the N as EKC (40EKC). Supplements were dosed ruminally prior to feeding hay (6.2% CP). Periods were 14 d, 8 d adaptation, 5 d to determine intake and digestion, and 1 d to quantify ruminal fermentation. During the project, 3 steers on 40EKC were removed due to anorexia (≤ 1.30 kg/d intake), attributed to treatment. Forage (6.12 kg/d) and total OM intake (6.70 kg/d) were greatest with 0PSC (P<0.01). Total OM intake with 40SKC, 20EKC, or NOSUPP (5.49, 5.30, and 5.25 kg/d, respectively) were similar (P=0.44); OM intake was lowest with 40EKC (4.13 kg/d; P<0.05; n=2). Supplementation did not increase total tract digestion (P≥0.79). All steers retained N, but 0PSC retained (34.7 g/d) more N than all other treatments (P<0.05), most likely due to the differences in N intake and energy availability. Steers receiving NOSUPP retained the least amount of N (7.0 g/d) which was not different (P=0.17) from 40EKC (15.5 g/d). Steers fed 20EKC and 40SKC retained similar amounts of N (22.9 and 19.7 g/d, respectively; P>0.05) and were similar to 40EKC, but greater than NOSUPP (P=0.01). Of PSC supplemented steers, provision of 40SKC resulted in the lowest apparent digestion of both pongamol and karanjin (219 and 393 mg/d, respectively), intermediate

was 20EKC (435 and 678 mg/d, respectively) and the greatest was 40EKC (789 and 1132 mg/d, respectively). Based on this study, 40EKC does not seem to be a viable option as a protein supplement for cattle, while 40SKC and 20EKC could potentially be utilized as protein supplements. Solvent extraction resulted in lower digestion of anti-quality factors than expeller pressing, and can be included at higher levels in supplements.

Keywords: Pongamia seedcake, protein supplementation, nutrient utilization

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030 Energy Requirements of Lactating Beef Cows in a Drylot System.

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Population growth and alternative use of agricultural lands continues at an alarming rate, which poses many challenges to food growers worldwide, particularly for meat-animal producers. Limited grazing land availability, modest feed prices, excess feedyard capacity and high cattle prices are among the factors that have stimulated interest in the expansion of semi-confinement and confinement systems for beef cattle production. The purpose of this research is to define cow and calf responses to a range of feed intakes and resulting energy provided to the cows. A total of 40 lactating beef cows were fed 114, 136, 156, 176, and 194 kcal NEm·(kg $BW^{0.75}$)$^{-1}$·hd^{-1}·d^{-1} for 111 d until weaning. This range of feed energy was accomplished by increasing the amount of feed provided using the same diet across all treatments. The ration consisted primarily of prairie hay, Sweet Bran® (wet corn gluten feed), cracked corn, and mineral supplement. Steer calves were offered the same ration as *ad libitum* creep feed along with milk and did not have access to cow feed. Cows were weighed, body condition scored (BCS), and milked by milking machine on a monthly basis; steers were also weighed monthly. Eight cows were fed each of the energy intake levels in separate pens. Monthly cow and calf BW, cow BCS and milk yield were regressed on date, and the mean of the linear regression coefficients of animals within an energy intake was then regressed on energy intake. Quadratic terms were tested and found non-significant. For each additional kcal NEm·(kg $BW^{0.75}$)$^{-1}$·hd^{-1}·d^{-1} fed to cows, cows gained an additional 0.583 kg/100 d ($P<0.01$) or 0.015 BCS units/100 d ($P<0.01$). Calf weight gain also increased with increasing cow energy intake ($P=0.013$). There was a strong tendency for increased milk yield with increased energy intake ($P=0.06$). In the range of these data, additional energy supplied to the cows resulted in linear increases in cow BW, BCS, milk yield, and calf BW.

Keywords: lactation, energy requirements, steer performance

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031 Effect of time of concentrate delivery on nutrient digestibility, ruminal fermentation, and solid passage rate in limit-fed steers consuming wheat straw.

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Delivery of limit-fed, total-mixed rations requires significant capital investment and creates logistical challenges. Separate delivery of forage and concentrate portions of the diet may decrease feeding cost. Therefore, effects of time of concentrate delivery in limit-fed steers consuming wheat straw were compared using 4 ruminally cannulated steers (371 ± 12 kg BW) in a 4×4 Latin square. Intake was restricted to 80% of NRC predicted NE_m requirements such that steers ate 52.88 g/kg $EBW^{0.75}$ of a diet consisting of wheat straw (35%), cracked corn (29%), and distillers' grains (27%) formulated to contain 1.58 Mcal NE_m/kg. Treatments were: concentrate fed 2 h prior to wheat straw (-2S), concentrate and wheat straw in a TMR (TMR), concentrate fed 2 h after wheat straw (2S), and concentrate fed 12 h after wheat straw (12S). Periods were 20 d each: 11 d adaptation to treatment, 7 d intake and digestion, 1 d ruminal fermentation profile, and 1 d passage rate determination. Nutrient intakes were similar, as designed ($P \geq 0.73$), and DE intake averaged 10.4 Mcal/d. Treatment had no significant effects on DM or OM digestion ($P \geq 0.88$). Dry matter digestion ranged from 69.2% for 12S to 68.3% for TMR. There was no effect on NDF digestion ($P = 0.90$) which was 61, 63, 63, and 62% for -2S, TMR, 2S and 12S, respectively. Gross energy digestion did not differ ($P \geq 0.90$) among treatments, with 12S having greatest GE digestibility (70.3%). No differences were observed for rate of particulate passage ($P \geq 0.55$), or ruminal DM fill ($P \geq 0.19$), which averaged 3.8 kg. Differences in VFA concentration were not detected ($P = 0.65$). A time × treatment interaction was observed for pH, acetate and propionate proportions ($P \leq 0.05$), but not for acetate to propionate ratios ($P = 0.23$). Nadir of pH was consistently observed 4 to 8 h after concentrate was delivered, but mean ruminal pH was similar among treatments ($P = 0.22$) ranging from 6.44 to 6.55 for 2S and 12S, respectively. Interactions resulted from a phase shift caused by anchoring analysis relative forage delivery; if evaluated relative to concentrate delivery, no time × treatment effect would be observed. Acetate proportion decreased directly after concentrate was delivered, whereas propionate increased. These findings suggest delivering forage and concentrate separately will not change digestion, and timing of concentrate delivery has little impact on ruminal fermentation.

Keywords: cattle, limit-fed, digestibility

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032 Effects of shoeing on the joints of the lower forelimb and hoof morphology of mature horses.

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Limited information is available pertaining to potential benefits of barefoot trimming techniques under standard management conditions. Therefore, twelve mature Quarter horses (8-14 y; 450-572 kg) were utilized in a 91-d trial to determine effects of barefoot trimming and shoeing on joints of the forelimb and digital cushion thickness. Prior to the start of the trial, all horses were adapted to a standardized exercise protocol and lameness examinations were performed by a veterinarian; hooves were allowed to grow naturally with minimal farrier interventions. Horses were group housed in adjacent dry lots and provided a commercially available concentrate formulated to meet or exceed 100% NRC requirements with ad libitum access to coastal bermudagrass hay. This study was divided into 2 phases: d 0-42 horses were barefoot trimmed (BF) and d 49-91 horses were shod (SD) on the forehand with standard St. Croix plain lite shoes. Horses were group exercised 3 times per wk on a 132 x 3.7 m linear dirt track. Pedometers were fitted to randomly selected horses to account for steps traveled during exercise. Measurements were obtained every 21 d following exercise and included thermography images (FLIR Systems; Boston, MA) of carpal and metacarpal joints, superficial horn of the frog, and medial and lateral sole of the front digits. Joint circumferences were obtained utilizing a soft tape measure level with the accessory carpal and proximal sesamoid bones, respectively. Digital cushion thickness was also measured ultrasonically through the superficial apex of the frog using a 5.0-MHz convex probe and stand-off pad following previously described methods. Data were analyzed using the PROC MIXED procedure of SAS. Mean circumferences of the carpal and metacarpal joints were greater ($P \leq 0.01$) in SD compared to BF. In BF phase, greater ($P \leq 0.01$) surface temperatures of the frog, medial, and lateral sole were observed. There was no main effect ($P \geq 0.52$) of d or treatment on digital cushion thickness. However, in BF phase horses (1.41 ± 0.13) had greater ($P \leq 0.01$) digital cushion thickness at d 42 compared to the equivalent (d 91) in the SD phase (1.26 ± 0.14). These data indicate that a shod fore digit may fail to establish hoof to ground contact that could lead to a limited vascular exchange. This alteration in lower limb and hoof load dispersion may cause an increase in the incidence of lameness over time.

Keywords: equine, hoof, barefoot

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033 Use of ultrasonography to evaluate the accuracy of objective and subjective measures of body composition in horses.

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Limited information is available regarding the utility of ultrasonic measurements of longissimus muscle area and fat thickness as non-invasive and objective means to evaluate body composition in horses. Therefore, 20 stock-type horses (2 to 10 y; 362 to 482 kg BW) were utilized in an 84-d trial to determine the relationship between ultrasonic measurements of lean and fat tissue with several common methods of evaluating body composition in horses. Feeding was divided into 2 phases: in phase 1 (d 0 to 56), horses were individually offered 2.5% BW coastal bermudagrass hay (Cynodon dactylon), and in phase 2 (d 57 to 84), horses received 0.75% BW of a commercially available pelleted concentrate (Cargill Animal Nutrition, Elk River, MN) that was formulated to meet 100% NRC requirements with an additional 1.5% BW coastal bermudagrass hay. All horses were maintained, housed, and exercised in accordance with objectives of the SHSU equine behavior and training course. Intake was adjusted every 7 d according to BW. Biweekly morphometric measurements including height, body length, heart girth circumference (HGC), body condition score (BCS), and topline evaluation score (TES) were obtained. In addition, ultrasonic measurements of rump fat (RF), back fat (BF), intramuscular fat (IMF) and longissimus muscle area (LMA) were collected by a certified technician. All images were evaluated by an independent laboratory (Designer Genes Technologies, Harrison, AR). Data were analyzed using the PROC CORR procedure of SAS to determine relationships between the subjective and objective measures of lean tissue and body fat. A moderate positive correlation existed between LMA and both height ($r=0.43$) and BCS ($r=0.32$); however, only weak positive correlations to LMA were observed for the measures of TES ($r=0.19$), body length ($r=0.13$), and HGC ($r=0.21$). Moderately positive correlations also existed between RF and both BCS ($r=0.50$) and TES ($r=0.28$), but there was no relationship between BCS or TES and BF. Ultrasonic measurements indicated that LMA has a greater relationship to height and BCS than HGC, body length, and TES. Relationships between ultrasonic measurements and other assessments of body fat were low to moderate with BCS having the strongest relationship. These results indicate that many of the common methods currently used to determine the body composition of horses are inaccurate and a comprehensive investigation regarding the utility of each of these conventional methods is necessary to justify their continued use in the equine industry.

Keywords: horses, body composition, ultrasonography

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034 Impact of Progesterone Supplementation on Pregnancy Rates Following Timed AI or Embryo Transfer in Beef Cattle Consuming Endophyte-Infected Fescue.

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Most tall fescue (*Festuca arundinacea*) is infected with a fungal endophyte (*Epichloë coenophiala*) that produces ergot alkaloids; hindering reproductive success by decreasing pregnancy rates and suppressing progesterone (P4) concentrations. The objective of this study was to determine if progesterone supplementation following timed AI or embryo transfer (ET) increases pregnancy rates (PR) of cattle consuming endophyte-infected tall fescue. Nulliparous and multiparous cattle were maintained on stockpiled endophyte-infected tall fescue. All cattle were synchronized using the standard 7d CO-Synch +CIDR® program. Cattle were inseminated 60-66 hr post-CIDR removal for TAI. In the ET group, cattle received either a fresh or frozen embryo on day 10 post- CIDR removal. Cattle received either a CIDR blank (control) or active CIDR ten d post-CIDR removal. Pregnancy and embryo area were determined by ultrasonography at d 30 of gestation. Data was analyzed using a PROC GLIMMIX procedure of SAS and examined for effects of treatment, year, location, and age. Statistical significance was determined at $P < 0.05$ and a tendency at $0.05<P<0.10$. There was no difference in PR with supplemental P4 7d following TAI in multiparous cattle (P4-21.08% vs. control-31.6%; $P>0.05$) or nulliparous cattle (P4-41.7% vs. control-41.7%; $P>0.05$). However, PR in heifers receiving P4 supplementation tended to differ by location (location1- 43.3% vs. location2 - 71.7%). There was a significant effect of year ($P<0.05$) for ET groups, therefore yr 1 and 2 were analyzed independently. In yr 1, P4 supplementation increased PR in ET cattle compared to controls (84.6% vs. 60.1%, respectfully; $P<0.05$). Additionally, supplemental P4 improved PR in cattle >7 yrs old (P4-98.7% vs. control-57.2%; $P<0.05$) and increased embryo retention in cattle receiving a frozen embryo (P4-96.7% vs. control-59.7%; $P<0.05$); this was not observed with fresh embryos. In the yr 2, there was no difference in PR with supplemental P4 (P4-36.8% vs controls-34.5%; $P>0.05$). However, supplemental P4 tended to increase pregnancy rates in Angus cattle receiving embryos (P4-43.8% vs. control-17.6%; $P<0.10$), but was not observed in crossbred cattle. Additional progesterone did not affect embryo area in either the TAI or ET groups. While progesterone supplementation throughout maternal recognition of pregnancy significantly increased PR in cattle receiving embryos in year 1, it did not show significant impact in year 2 or following TAI in cattle consuming endophyte-infected tall fescue for both years.

Keywords: fescue toxicity, progesterone supplementation, embryo transfer

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035 Association of DRD2 with Growth and Performance Traits in Cattle Grazing Endophyte-Infected Tall Fescue.

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Fescue Toxicosis (FT) negatively impacts growth and fertility of beef cattle grazing tall fescue infected with an endophytic fungus. The fungus produces chemical compounds including ergovaline that contribute to the heartiness of the plant but are detrimental to the animal. A single nucleotide polymorphism in the dopamine receptor D2 gene (DRD2) has been associated with serum prolactin concentrations and hair coat scores in cattle grazing endophyte-infected tall fescue (E+); cattle with the GG genotype had decreased serum prolactin concentrations and increased hair coat scores. Separately, heifers with the AA genotype calved sooner than AG or GG heifers. In this study, DRD2 genotype-phenotype associations with growth and performance of bulls grazing either E+ or non-toxic endophyte-infected (NTE) tall fescue were examined. The bulls remained on treatment from late February through mid-June. Urine samples and semen samples were collected as well as body weights, scrotal circumferences, and body condition scores, in April and again in May. Genotypes for DRD2 were obtained from sperm pellets of each bull using a bovine Taqman assay. Associations of DRD2 genotype with each phenotype were evaluated using mixed model analysis of variance in SAS. Significance was noted for $P < 0.05$; trends where $0.10>P>0.05$ were also noted. Main effects of treatment, month, and genotype were assessed as well as their interactions. Genotype was found to be associated with body weight such that AA bulls have a higher body weight (BW) than GG bulls. A direct effect of month as well as a month*treatment interaction was observed such that BW increased from April to May in both treatment groups but slightly more in the E+ relative to NTE animals. An association between DRD2 genotype and scrotal circumference (SC) was noted such that AA bulls had greater SC than AG bulls but not GG bulls. No other effects on SC were observed. As expected, urine concentrations of ergovaline were greater in E+ bulls relative to NTE bulls. Urine concentrations of ergovaline were also found to be associated with DRD2 genotype; concentrations were almost two-fold greater in GG bulls than in either AA or AG bulls. A genotype*treatment interaction was observed such that the GG bulls grazing E+ fescue exhibited the greatest urine concentrations of ergovaline. These findings further support the utilization of DRD2 genotype as a selection tool to enhance the performance of beef cattle grazing E+ tall fescue.

Keywords: Fescue toxicosis, Genetics, Beef cattle

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036 Development of an equine non-contact thermography device: Evaluation of thermal expression on multiple sites of the horse as an indicator of body temperature.

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Currently, rectal temperature is the standard used to determine body temperature in horses. While this method is reliable, it can become a safety concern for handlers and cause stress on the animal. New technologies such as infrared thermal imaging cameras are being tested as possible alternatives. The objectives of this research were to compare a prototype non-contact thermography device (NCT) to a traditional FLIR® thermal imager (FLIR Systems Inc., Wilsonville, OR) and to determine the relationship between rectal temperatures and thermographic body measurements on the horse. To accomplish this, 100 measurements were taken on 12 sedentary horses (5-15 yr; 357 to 540 kg) over a 9-day period. Measurements were collected at a distance of 1 m using the FLIR® and NCT at the following locations of the head and body: ocular globe of the eye, forehead, bridge of the nose, muzzle, lower lip, throat latch, behind the ear, chest, front face of the knee, cannon bone, girth, flank, hock, and tail head. Rectal temperatures were obtained to serve as standardized body temperatures. Ambient temperature and relative humidity were also recorded to account for environmental effects. Data were analyzed using the PROC CORR and PROC REG procedures of SAS. Strong correlations were found between the NCT:FLIR® at the forehead, chest, knee, cannon, girth, flank, hock, and tail head, with all values being greater than r = 0.55. The most consistent correlations across all three methods were found at the girth and flank. The girth had relationships of r = 0.58 ($P < 0.01$) for NCT:FLIR®, r = 0.34 ($P < 0.01$) for NCT:Rectal, and r = 0.35 ($P < 0.01$) for FLIR®:Rectal. At the flank, the relationships were r = 0.58 ($P < 0.01$) for NCT:FLIR®, r = 0.32 ($P < 0.01$) for NCT:Rectal, and r=0.40 ($P < 0.01$) for FLIR®:Rectal. Data were also analyzed through a stepwise regression to determine if a combination of sites would produce a suitable relationship to rectal temperature; however, all R-squared values were found to be weak. The greatest coefficients for the devices were calculated when all 14 sites were combined producing $r^2 = 0.24$ for the NCT and $r^2 = 0.30$ for the FLIR®. These data indicate that the non-contact thermography devices were functioning similarly to one another at certain sites of the horse, but further research needed to determine their utility in a production setting.

Keywords: Horse, Thermography, body, temperature

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GRADUATE STUDENT COMPETITION MS II

037 Composition and Quality Assessment of the Woodland Browse Species and Goats' Performance Study under Woodland.

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Season based nature of forage availability is one of the hindrances in raising goats in pasture throughout the year. There exists a gap in forage availability when cool-season forages are dead or dormant and warm-season forages are still to come, such as from late April to May to June. Another gap exists when warm-season forages are about to be dormant or dead and cool-season forages are still to come, such as from late September or October to December or January. Browsing in woodlands can be helpful to bridge some of these gaps. This study was conducted at the Tuskegee University woodlands located at Atkins camp site from last week of May to first week of July, 2015 to evaluate the complementarity of woodlands for year-round grazing for goats. The objective of this study was to evaluate the performance of goats for different woodland plant species. Six to eight month Kiko wethers (29) were rotationally grazed at the study site using five plots (one-acre each) and two control plots where no goats were grazed. They were provided one week as an adjustment period before the measurements were taken. The overall weight gained by the goats within the study period was 1 lb (59±1.38 to 60±1.48 lbs), with decreasing average body conditioning score (2.4±0.06 to 1.9±0.10) and decreasing average FAMACHA reading (3±0.10 to 2.8±0.17). The average browsing line for the browse species was (56±0.6 inches) with goats reaching high for Sumac, Kudzu, Yaupon, Black cherry, Winged elm. The crude protein (CP) was highest for the kudzu (15.3%) followed by dog fennel (14.09%) and beautyberry (12.07%). The neutral detergent fiber (NDF) was highest for the persimmon (55.90%) followed by winged elm (55.38%) and willow oak (52.16%). The acid detergent fiber (ADF) was lowest in wild plum (16.8%) followed by sumac (19.16%) and black gum (20.35%). Sparkle berry (8.21%), winged elm (7.682%) and wild plum (5.69%) were amongst the highest tannin containing plants.

Keywords: forage, Kiko, wether, CP, ADF, NDF, tannin

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038 Effect of dietary energy intake on nutrient utilization, performance, and maintenance requirements in late gestation cows and their calves.

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Drought and elevated land prices challenge the US cow-calf sector to meet increasing global beef demands via conventional, extensive methods. An alternative cow feeding and calving approach, accomplished in a controlled environment (i.e. drylot) was investigated using sixty, multiparous, late-gestation beef cows (461.5 kg initial BW). Cows (N = 60) were blocked by BW and individually fed one of four treatments (70, 85, 100, and 115% of NRC-predicted maintenance energy) in Calan gates for an average of 71 d before calving. Diets consisted of 2.00 kg of wheat straw (2.5% CP; 79% NDF) and four levels of a mixture of corn (45%), distiller's grain (42%) and premix (13%) fed at 2.70, 3.42, 4.12, and 4.85 kg/d to correspond with the 70, 85, 100, and 115% treatments. Following calving, pairs were managed as a group on pasture. Digestible energy intake increased linearly (11.84, 13.55, 15.53 and 17.71 Mcal/d for 70, 85, 100, and 115%; $P < 0.01$) per design; ME intake responded similarly (9.71, 11.11, 12.74 and 14.53 Mcal/d). No treatment differences ($P > 0.05$) in digestibility were observed; DM digestibility averaged 62%. Cow retained energy over the duration of the study increased linearly ($P < 0.01$) from 46.6 Mcal for 70% to 50.7, 106.3, and 123.8 Mcal for 85, 100, and 115%. Body weight gain increased linearly ($P < 0.01$) from 0.7 kg for 70% to 3.6, 17.7, and 24.2 kg for 85, 100, and 115%. Calf birth weight increased linearly ($P = 0.01$) from 32.5 kg for 70% to 35.5, 35.2, and 36.8 kg for 85, 100, and 115%. There were no differences ($P > 0.05$) in cow or calf body weights among treatments at 60, 90, 120 or 160 days post parturition. Brix (%) values of cow colostrum at parturition did not differ ($P > 0.05$). Immunoglobulin G levels in calf serum collected 24 h after birth did not differ ($P > 0.05$). No differences ($P > 0.05$) in postpartum interval were observed. Production goals of the cow-calf sector can be successfully met by limit feeding late-gestation beef cows in a drylot setting at levels at least 70% of NRC-predicted energy requirements for maintenance.

Keywords: confinement, limit-fed, cattle

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039 Effect of surgical castration with or without oral meloxicam on growth, behavior and inflammation in pre-weaned beef calves.

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Use of analgesics during painful management procedures such as castration warrants investigation, yet the efficacy of pain management strategies may be impacted by the age of animals in which the strategy is applied. The objective of this study was to evaluate the effects of oral administration of the analgesic meloxicam (1 mg/kg BW) on growth performance, behavior and inflammation in calves castrated at the time typically known as branding (~90 d of age). Crossbred beef bulls (n=83; 105.8 ± 7.1 kg) from a single herd were assigned randomly to 1 of 3 treatments: 1) positive control consisting of intact males through weaning (CON), 2) surgical castration at branding (CAS), and 3) surgical castration at branding with oral meloxicam (MEL). Calves were housed with their dams in 6 different cohort pastures with treatments similarly represented in each pasture. Body weights were recorded on d 0 (branding), 7, 14, 28, 56, 84 and 112 (weaning) to determine gain performance. Blood samples from a subset of calves (n=27) were collected on d 0, 0.25, 1, 3, and 7 and used to quantify serum haptoglobin (Hp) concentration as a proxy for systemic inflammation and complete blood count (CBC) was determined via automated hemocytometer using whole blood. Calves were fitted with accelerometers on d 0 to measure behavior variables. No differences in BW were detected at weaning (P=0.95); however, performance was reduced (P=0.05) in the CAS group for 2 wk following castration. The ADG from d 0 to 14 was 0.75, 0.44, 0.68 kg/d for CON, CAS and MEL, respectively. Meloxicam administration altered lying behavior following castration; time spent lying on sternum as a proportion of total lying time was decreased for MEL (48.0%) compared to CON (52.1%) and CAS (53.5%) groups (P<0.10). Serum Hp concentration was less (trt x time; $P \leq 0.05$) for CON compared to the CAS and MEL groups on d 0, 0.25, 1 and 3, but no differences were observed between castrated groups for those time periods. Total white blood cell count was increased (trt x time; P<0.001) on d 0.25 for CAS with no differences observed between CON and MEL. Meloxicam tended (trt x time; P=0.10) to reduce eosinophil count on d 3 and 7 compared to CON and CAS

groups. Both CAS and MEL resulted in increased Hp concentration relative to CON; whereas, ADG was transiently reduced for CAS but not CON or MEL.

Keywords: beef cattle, castration, meloxicam
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040 Heat production, respiratory quotient, and methane loss subsequent to LPS challenge in beef heifers.

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Respiration calorimetry was used to measure energy utilization during an acute phase response (APR) to lipopolysaccharide (LPS). Eight Angus heifers (208±29.2 kg) were randomly assigned to one of two calorimeters in four 2-d periods for measurement of heat production (HP), methane (CH_4), and respiratory quotient (RQ). Corn silage diets were fed at 1.0 X NE_m. Exit velocity measured at weaning (wEV) was an indicator of temperament. Rectal temperature (RT) was recorded every five minutes using indwelling temperature loggers. Data from d1 served as a control (CON) for each heifer. Lipopolysaccharide was administered intravenously at 0.5 µg/kg BW 2h after feeding on d2 (0h). Respiratory gas exchange was determined at 10 minute intervals from 0h to 24h. At each time point, RQ was determined and HP was calculated from O_2, CO_2, and CH_4 changes using Brouwer's equation. Data were divided into two 12-h periods (Phase I and Phase II) for repeated measures analysis with SAS Proc Mixed. After LPS, RT revealed a biphasic response typical of an LPS challenge. For both CON and LPS periods, RQ declined postprandially (0.95-1.00 to 0.85-0.90) across Phase I (time x LPS P<0.01). With LPS, RQ during the first 6h of Phase I tended to be more erratic, whereas values during the latter half of this phase were generally lower with than without LPS. A wEV x LPS interaction was detected for RQ during Phase II (P=0.05) in which LPS-induced depression in RQ increased with increasing wEV. The average RQ was 0.86 and 0.80±0.004 for CON and LPS, respectively, during Phase II. There was large individual animal variability in HP response to LPS in which some animals increased and some decreased HP in response to LPS. Thus, no time x LPS (P>0.10) or LPS (P>0.12) effects were found for HP in either phase. However, wEV effects were found (P<0.04) in both phases, where HP increased by about 7 to 8% of mean HP for each 1m/s increase in wEV. Methane production (L/min) was reduced by 23% with LPS in Phase I. In Phase II, LPS-induced reduction in CH_4 was influenced by wEV (P=0.03). At low wEV, LPS effects were nonsignificant (P=0.17), whereas at average and high wEV, CH_4 was depressed (P<0.01) by 33 and 54%, respectively. Heat production responses during the APR of LPS challenge were highly variable among individuals, yet HP among individuals was related to weaning exit velocity.

Keywords: lipopolysaccharide, calorimetry, heifers
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041 Evaluations of Savanna Sires Compared with Kiko and Spanish Sires for Birth to Weaning Meat Goat Kid Traits.

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The purpose of this study is to observe the sire breed effects on preweaning performance traits and survivability of Savanna offspring compared with Kiko and Spanish offspring managed on a humid, subtropical pasture. Straightbred Savanna (n = 12), Kiko (n = 9) and Spanish (n = 8) bucks were used over a three year study and bred to straightbred and crossbred does. The offspring (n = 434) were spring born. The birth and weaning weights were collected, and average daily gain (ADG) was then calculated from birth to weaning. 90-d adjusted weights were then calculated. Some groups were treated with creep feed in two of the three years. These treatment effects were analyzed as sources of variation along with sire breed, dam age, litter size and sex. The Kiko and Spanish breeds were compared with the Savanna using individual two-breed diallel models. Dam age affected ($P < 0.05$) the 90-d adjusted weight and the ADG of the offspring. The bucklings had heavier ($P < 0.05$) weights compared with the doelings in all weight traits. Single kid litters had heavier weights and a higher survivability ($P < 0.05$) compared with multiple kid litters. Kids that were creep fed had heavier ($P < 0.05$) 90-d adjusted weights and ADG than those that were not creep fed. The Savanna offspring had heavier ($P < 0.05$) birth weights (3.21 ± 0.11 kg) than the Kiko offspring (2.86 ± 0.11 kg). The Savanna offspring also had heavier ($P < 0.05$) birth weights (3.00 ± 0.20 kg) when compared with the Spanish offspring (2.74 ± 0.20 kg). There was no difference ($P > 0.05$) in 90-d adjusted weights when Savanna offspring were compared with Kiko offspring (13.17 ± 0.52 vs. 13.48 ± 0.53 kg), nor when compared with Spanish offspring (11.76 ± 0.53 vs. 11.23 ± 0.56 kg). There was no difference ($P > 0.05$) in ADG when the Savanna offspring were compared with the Kiko offspring (0.110 ± 0.006 vs. 0.116 ± 0.006 kg), nor when compared with the Spanish offspring (0.095 ± 0.006 vs. 0.092 ± 0.006 kg). There was no difference ($P > 0.05$) in survivability of the Savanna offspring when compared with the Spanish (80 vs. 87%) and Kiko (86 vs. 86%) offspring. The Savanna sires generated heavier birth weights than the Kiko and Spanish sires, but there were no other significant sire breed effects.

Keywords: Sire breed, Preweaning growth, Meat goats
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042 Changes in Body Condition from Prepartum to Postpartum on Reproduction in Dairy Cattle.

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The aim of this study was to body condition score (BCS) 72 Holstein-Friesian dairy cows at 45 d prepartum to categorize them into lean (BCS < 3.25), moderate (BCS = 3.25-3.75), and over-conditioned (BCS > 3.75) categories and then relate changes in BCS and effects of milk yield and health status [haptoglobin (Hp), hematocrit, immune cells and disease status, which were measured at d 0- 10 and d 20-26] on conception determined 26-32 d post-insemination (mean 95 d postpartum). The BCS changed (p=0.0001) with time with the greatest loss occurring in the over-conditioned cows. However, BCS losses for each body type did not have a significant effect on subsequent reproductive success. Frequency of health disorders were related (p=0.01) positively to parity. Disease status at d 0 to 10 (p=0.006) and during d 20 to d 26 (p<0.0001) postpartum affected pregnancy rates; subsequent pregnancy rate for cows that were diseased at d 0 to 10 was 9% vs 59% for healthy cows and for cows at d 20-26 was 0% for diseased vs 42.5% for healthy cows. While hematocrit was not a predicator of pregnancy success, hematocrit values were lowest at d 20-26 compared to other times (29.1% vs 32.7%, p=0.0001). Total WBC at d 20-26 was negatively related to pregnancy outcome (p=0.028). Concentration of Hp at d 20-26 was not associated with disease status; 19 healthy cows had above average Hp. Pregnancy success was associated with above average Hp (lnHp ≥ 3.9) and above herd average milk yield (≥ 42.67 kg/day); 66.6% in high Hp cows vs 25% in low Hp cows in high producing cows (p =0.0003) and in high Hp cows 6.7% vs 38.5% in low Hp in low producing cows. At d 20-26, high Hp–high milk cows that became pregnant had lower monocytes (p <.01) and lymphocytes (p<.01) than high Hp–high milk cows that did not become pregnant. The study revealed that body condition was not a good indicator of reproductive success but prevalence of disease and health disorders in early postpartum decreased pregnancy success to first artificial insemination.

Keywords: Dairy Cattle, Reproductive Success, Body Condition Score, Haptoglobin, Milk Yield

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043 Relationships Between Prolactin Genotypes and Dairy Heifer Growth and Development.

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Tall fescue is grown across the Midwestern and Southeastern United States. Susceptibility to ergot alkaloid poisoning, fescue toxicosis, has been associated with SNP in the cytochrome P450 and dopamine D3 genes. Animals grazing toxic fescue typically have lower circulating prolactin (PRL) concentrations, and decreased overall performance. Therefore, the objective of this study was to evaluate the associations among stockpiled tall fescue cultivar, blood cell distributions, and two SNP sites in the PRL gene of cattle. Crossbred dairy heifers (Holstein x Jersey; n = 31) were stratified by BW and allocated randomly to one of two treatments: 1) Kentucky 31 (KY31; wild-type endophyte-infected; 4 paddocks) and 2) HiMag 4 (HiMag; non-toxic endophyte-infected; 4 paddocks). Heifers had ad libitum access to water and were given a daily corn-based grain supplement (~0.8% BW). Blood cell differentials and BW were evaluated on d 0, 28, 56, and 84. Genomic DNA was extracted from buffy coat and genotypes were determined using the Sequenom technique (GeneSeek, Lincoln, NE). Two SNP sites were of interest with one located in the promoter region (C1286T) and the other located in exon 4 of the coding sequence (G8398A). Data were analyzed using mixed model ANOVA with paddock as the experimental unit; and weight and blood cells treated as repeated measures. Main effects of fescue cultivar, genotype, date of sample, and their interactions were tested. When F-tests were significant means were separated with multiple t-tests. Heifer BW increased during the 84 d grazing study, and was affected by an interaction (P < 0.05) of G8398A and cultivar, and the interaction (P < 0.05) of C1286T and cultivar. Heifers that carried either one or two copies of the minor allele for either SNP site and grazing KY31 had the heaviest weights. The number of white blood cells (WBC) was affected by a G8398A*cultivar interaction (P < 0.05) which resulted in homozygous heifers grazing KY31 have more WBC than heterozygous heifers grazing KY31. The number of red blood cells was affected by a G8398A*cultivar and C1286T*cultivar interactions (P < 0.05); however, all heifers had normal cell concentrations with no consistent pattern to explain the interaction. Our results indicate that stockpiled tall fescue has potentially toxic concentrations of ergot alkaloids depending on the genotype of the heifer. Prolactin genotypes may be useful in selecting more productive replacement dairy heifers.

Keywords: Prolactin, Single Nucleotide Polymorphism, Tall Fescue

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044 Inclusion of post-extraction algal residue in finishing rations of beef steers: Consumer sensory panel ratings and fatty acid composition of ground beef.

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Microalgae cultivation as a biofuel source will yield a high volume of post-extraction algal residue (PEAR) that could be fed to ruminants. Inclusion of PEAR in finishing diets of beef cattle is only viable if it does not have negative effects on beef quality and flavor. To investigate the impact of PEAR on beef flavor, ground beef from 12 Angus × Hereford beef carcasses was analyzed. For the last 35 d prior to harvest, steers received one of two randomly assigned finishing treatments: PEAR hand-mixed into the diet at 1.0 kg OM/d (PEAR) or 1.0 kg OM/d glucose infused ruminally (GR). Infused steers were ruminally cannulated, allowing continuous infusion of glucose via anchored infusion lines. Seventy-two h post-harvest, beef subprimals and subcutaneous adipose tissue from the chuck and round of each carcass was collected for consumer and fatty acid analysis. Ground chuck and ground round batches were all formulated to contain 20 ± 2% fat. Data were analyzed as a 2×2 factorial treatment arrangement (diet: GR or PEAR; primal: chuck or round). The only diet × primal interaction ($P = 0.02$) was for palmitoleic acid concentration in ground beef; PEAR ground round (4.50%) had more palmitoleic acid than PEAR ground chuck (2.92%) and GR ground round (3.78%) had more palmitoleic acid than GR ground chuck (2.93%). Compared to GR ground beef, supplementation of PEAR increased myristic, palmitic, and eicosapentaenoic acid concentration ($P \leq 0.03$), while oleic acid decreased ($P < 0.01$). Myristic, myristoleic, palmitoleic, oleic, and eicosapentaenoic acid were at higher concentrations ($P \leq 0.02$), while stearic acid was lower (11.99 vs. 16.05%; $P < 0.01$) in ground beef from the round than from the chuck. Diet did not affect flavor, beefy flavor, juiciness, or overall liking of ground beef by consumers ($P \geq 0.58$). Additionally, there was no effect of primal on flavor, juiciness, or overall liking ($P \geq 0.17$). However, ground beef from the round was better liked (6.54) than ground beef from the chuck (6.15; $P = 0.04$); but while this difference is statistically different, the magnitude of the difference indicates little meaningful segregation of these products in the marketplace. Inclusion of PEAR in finishing rations at 10% did not result in result in differences in ratings by consumers on likability of ground beef products, but did result in changes in fatty acid composition of ground beef.

Keywords: post-extraction algal residue, beef flavor, consumer panel

doi: 10.2527/ssasas2015-044

GRADUATE STUDENT COMPETITION PHD

045 The effect of weaning stress, sex and temperament on fecal microbiota in Brahman calves.

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A diverse microbial community, also known as microbiota, inhabit the mammalian digestive tract. The effect of weaning, sex classification and temperament on the bovine fecal microbiota is not fully understood. The goals of this study were to 1) investigate the effect of weaning on the fecal microbiota in Brahman calves, and 2) compare the fecal microbiota between males (bulls) and females (heifers) as well as between calm and temperamental animals at weaning (d0) and 4 days post weaning (d4). Temperament score (average of pen score and exit velocity) was used to classify calf temperament. Rectal grab fecal samples collected from the same 10 calm and 10 temperamental animals (5 males and 5 females of each temperament classification) at d0 and d4 were analyzed. Bacterial DNA was extracted using the PowerFecal kit (MoBio). Illumina sequencing of the V4-V6 region (*E. coli* position 530-1100) of the 16S rRNA was performed on a MiSeq. Raw sequence data were screened, trimmed, filtered, denoised and chimera depleted using default QIIME 1.8 software settings. Alpha and beta diversity measures were calculated and plotted. Differences in microbiota composition between sampling days, sex and temperament were assessed by unweighted and weighted UniFrac distance metrics and plotted on principal coordinate analysis (PCoA) plots. The ANOSIM function was used on UniFrac distance matrices to determine the statistical difference of microbiota between groups ($P<0.001$). Linear discriminant analysis effect size was used to determine differentially abundant bacterial taxa ($P<0.05$). Metagenomes for the identified microbial operational taxonomic units (OTUs) were predicted using Phylogenetic Investigation of Communities by Reconstruction of Unobserved States (PICRUSt) and analyzed with Statistical Analysis of Metagenomic Profiles (STAMP) software. The PCoA plot showed significant separation between the fecal samples from d0 and d4. A total of 44 bacterial taxa and 29 metabolic pathways were differentially abundant between d0 and d4. Additionally, 21 taxa were differentially abundant between males and females at d4. Six and 20 taxa were differentially abundant between temperamental and calm animals at d0 and d4, respectively. These data sug-

gest that while weaning has a major impact on microbiota composition in Brahman calves, sex of the calf and temperament are associated with differentially abundant bacterial taxa within a sampling day.

Keywords: bovine, weaning, temperament, microbiota
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046 Relationships among temperament, endocrinology, and reproductive soundness of performance-tested Angus bulls.

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Excitable cattle exhibit greater concentrations of cortisol than calm cattle, which can negatively impact an animal's reproductive performance. The aim of this study was to examine the relationships among temperament, endocrinology, and reproductive soundness of Angus bulls consigned to an 84-d post-weaning performance test. Bulls (n = 60; 263 ± 36 d of age) arrived at the University of Tennessee Bull Testing Station on d -14 and were housed in 6 pens based on age and weight. Pen scores (PS; 1 (calm) to 5 (excitable)) were assigned on d -1, 27, 55, and 83. Exit velocity (EV; m/s) was evaluated on d 0, 28, 56, and 84 and serum and hair samples were collected on the same days. All hair samples were collected from the same region on the bull. Breeding soundness exams were performed on d 84. Hair and serum samples were analyzed for testosterone and cortisol concentrations via ELISA and RIA, respectively. Bulls were categorized as PScalm (PS = 1 or 2) or PSexcitable (PS = 3 or 4) based on initial PS. Bulls were also categorized as EVcalm or EVexcitable based on the fastest 20 and slowest 20 initial EV. A mixed model ANOVA with repeated measures was performed (SAS 9.3). Scrotal circumference did not differ (P>0.10) between PScalm and PSexcitable or EVcalm and EVexcitable bulls. Cortisol and testosterone concentrations in serum and hair did not differ (P>0.05) between temperament categories, but day differences occurred. Hair testosterone concentrations were the greatest (P<0.01) on d 0, but remained constant from d 28 to 84. Hair cortisol concentrations were the greatest (P<0.01) on d 0, decreased from d 28 to 56, but remained constant between d 56 and 84. Serum testosterone increased (P<0.01) from d 0 to 28, decreased from d 28 to 56, while d 84 did not differ from d 0, 28, or 56. Serum cortisol concentration did not differ (P>0.10) over the testing period. In summary, after the initial hair clipping, hair testosterone accumulation was consistent throughout the testing period and hair cortisol accumulation leveled over time as bulls acclimated to the testing center.

Keywords: bulls, hormones, temperament
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047 Reproductive measurements of Angus and Angus _ Hereford crossbred heifers treated with long-acting eprinomectin or a combination of moxidectin and oxfendazole.

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Internal parasites cause detrimental effects on animal performance. The objective was to evaluate the effects of various anthelmintic therapies on reproductive performance in crossbred beef heifers. Eighty-three fall-born, Angus crossbred, heifers were stratified by d -14 BW and fecal egg counts, and d of age. Heifers were allocated randomly to 1 of 3 anthelmintic treatments consisting of: 1) control (n = 28; no anthelmintic administered; CON); 2) moxidectin/oxfendazole combination (n = 28; MO); or 3) long-acting eprinomectin (n = 27; LA). Heifers grazed in individual treatment groups on 10-ha pastures consisting of predominately endophyte-infected tall fescue and were offered a corn gluten supplement daily at 1% BW. To evaluate heifer cyclicity, progesterone concentrations were determined on d -10 and 0 of the breeding season. Heifers were administered 25 mg of prostaglandin F_2alpha on d 0 of the breeding season and equipped with an Estrotect patch. Heifers were artificially inseminated (AI) if detected in estrus within 1 wk. Prostaglandin F_2alpha was re-administered on d 7 of the breeding season to heifers that did not display estrus and estrous detection and AI continued until d 10. One fertile bull was placed in each treatment group on d 15 of the breeding season and remained in each pasture for 52 d. Pregnancy was determined via ultrasonography on d 62 for AI heifers and again on d 106 for natural service (NS). Reproductive measurements were analyzed using PROC FREQ of SAS. Two contrasts were used to evaluate effects and included comparing CON and treated heifers and also comparing MO-and LA-treated heifers Percentage of heifers that were considered cyclic, displayed estrus, and conceived through either AI or NS did not differ ($P \geq 0.16$) between MO and LA. Overall pregnancy rates tended ($P = 0.10$) to be greater for LA compared with MO (88% vs 71%, respectively). Percentage of heifers that were considered cyclic was greater ($P < 0.01$) for treated heifers compared with CON (65% vs 11%, respectively). Detected estrus was greater ($P = 0.02$) for treated heifers compared with CON (43% vs 11%, respectively). Overall pregnancy (80% vs 50%) and NS conception rates (75% vs 44%) were greater ($P \leq 0.01$) for treated heifers compared

with CON. Therefore, anthelmintic therapy positively impacts heifer reproductive performance.

Keywords: conception rates, long-acting eprinomectin, moxidectin/oxfendazole

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048 Effects of an intensified, semi-confinement cow/calf production system on feedlot performance of growing and finishing steers.

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In the first year of a multiple-year experiment, feedlot performance and carcass traits were evaluated for 39 fall-born Angus, Angus x Hereford steers from two cow/calf production systems. Production systems were 1) intensive, semi-confined production system utilizing native range (spring and fall), drylot feeding with limited winter wheat pasture grazing (winter), and limited cover crop grazing (summer); 2) extensive, season-long continuous grazing on native range with protein supplementation during winter, representative of traditional cow/calf management in the region. Initial BW upon entering the feedlot was greater for steers produced in the intensive (IS) system than for steers in the extensive (ES) system ($P < 0.05$) at 370 and 334 kg hd^{-1}respectively. Analysis of Variance was conducted using the GLM procedure in SAS software. Back fat thickness was included as a covariate in analysis of performance and carcass traits. Steers produced in the IS had 18 % greater ($P < 0.05$) ADG and a 15% improvement ($P < 0.05$) in gain per unit of feed (G:F) . Steers produced in IS had a 5% greater ($P < 0.05$) live finished weight, 3.2% greater ($P < 0.05$) hot carcass weight, and 6% lower kidney, pelvic, and heart (KPH) fat ($P < 0.05$), than ES steers. There was no difference in marbling ($P > 1.0$) but there was a trend for ribeye area to be greater in IS steers than in ES ($P = 0.14$). Yield grade was 13% lower ($P < 0.05$) in IS Steers than in ES steers at 3.2 and 3.6 respectively. Postnatal grazing management system had a dramatic impact on summer feedlot entry weight, feedlot performance and carcass characteristics in a fall-calving system. Improved winter nutrient status when cows limit grazed and calves grazed wheat pasture ad libitum resulted in greater summer weaning weight followed by increased weight gain and feed conversion during the finishing phase.

Keywords: Feed efficiency, ADG, carcass traits

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MEATS

049 Inclusion of post-extraction algal residue in finishing rations of beef steers: Trained sensory panel ratings for strip steaks.

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Microalgae's viability as a biofuel is partially dependent on development of a market for its co-product, post-extraction algal reside (PEAR). The protein rich co-product, PEAR, is being considered as a nutrient source for cattle. To investigate the impact of PEAR inclusion in finishing rations on beef flavor, 18 Angus × Hereford steers (initial BW = 549 ± 38.8 kg) were assigned randomly to one of three treatments designed to replace OM in the diet: PEAR hand-mixed into the diet at 1.0 kg OM/d (PEAR), 1.0 kg OM/d glucose infused ruminally (GR) or 1.0 kg OM/d glucose infused abomasally (GA). Basal diets consisted of dry rolled corn (42.3%), ground milo (18.0%), cottonseed hulls (13.5%), grass hay (10.0%), molasses (6.7%), cottonseed meal (5.4%), vitamin/mineral premix (2.3%), urea (0.9%), and limestone (0.9%). Treatments were applied for the last 35 d prior to harvest. Forty-eight h post-harvest, strip steaks were collected from each carcass, individually vacuum packaged, aged for 14 d, and frozen until analysis. An expert-trained sensory panel was conducted over 3 consecutive d. Data were analyzed using the MIXED procedure of SAS. The fixed effect in the model was treatment and panel day was included as a random effect. Least-squares means were calculated and all pairwise comparisons were evaluated. Of the flavors and aromas present in PEAR-fed beef, there was a treatment difference in fat-like flavor ($P = 0.02$); PEAR strip steaks were not different from either GA or GR ($P > 0.10$), but GA and GR were different in fat-like flavor ($P < 0.01$). Additionally, overall sweet (flavor and aromatics) was different among treatments ($P = 0.05$); only PEAR steaks were higher in overall sweet flavor and aromatics than GA (0.58 vs. 0.30; $P < 0.02$). Sweet flavor also differed among treatments ($P < 0.01$); steaks from PEAR supplemented steers were sweeter than GA ($P < 0.01$) and GR ($P < 0.02$). Provision of PEAR in finishing rations of beef steers, compared to glucose infusion, did not result in significant or numeric differences in beef identification, brown/roasted, bloody/serumy, metallic, umami, sour, salty, bitter, or burnt flavor attributes ($P \geq 0.13$). There were no off-flavors detected in strip steaks from inclusion of 1.0 kg OM/d PEAR compared to glucose infusion. Therefore, this PEAR preparation can be included in a finishing ration at up to 10% without negatively impacting beef flavor and aroma.

Keywords: post-extraction algal residue, beef flavor, trained panel

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050 Peracetic acid effects on shelf life and survival of *E. coli* on beef steaks.

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Peracetic acid, also known as PAA, has been used successfully in the poultry industry to reduce the bacterial load of *Salmonella* and *Campylobacter*. The objective of this study was to evaluate the effectiveness of PAA in reducing *Escherichia coli* 0157:H7 in beef. In this study, 150 slices of beef ball tips weighing 100g each were inoculated with either a high (10^6) or a low (10^2) concentration of five strains of *E. coli* 0157:H7. After a 30 minute attachment time, the inoculated samples were treated with either 0.012% (120ppm) PAA, 0.04% (400ppm) PAA, or were left untreated as a positive control. A shelf life study was conducted to determine quality of meat over 7 days of refrigerated (4 ± 2°C) storage. Sensory evaluation was also performed on un-inoculated samples. After a 5 minute treatment time, the samples were sprayed with sodium thiosulfate to neutralize the reaction, and then the samples were stomached and plated onto CT-SMAC plates and incubated for 24 hours before being counted. This process was repeated 3 times on different days. For the low (10^2) concentration of *E. coli* 0157:H7, the 0.012% treatment of PAA reduced bacterial growth by 0.067 logs, which was not different ($P>0.05$) than the control. The 0.04% treatment for the low concentration of *E. coli* 0157:H7 was different ($P<0.05$), reducing the bacterial growth by 0.568 logs. When treatment was applied to the high (10^6) concentration of *E. coli* 0157:H7, both the 0.012% treatment and the 0.04% treatment of PAA reduced ($P<0.05$) bacterial growth (reductions were 0.12 logs and 0.19 logs, respectively). While both 0.012% PAA and 0.04% PAA reduced the amount of *E. coli* 0157:H7 when compared to the positive controls, not all reductions were significant. Similar bacterial counts were seen in the shelf life results, and over the course of seven days, color deteriorated but there were no differences ($P>0.05$) in treatments. There were also no differences ($P>0.05$) in sensory evaluation scores among treatments. Treatment with 0.04% PAA was the most effective at reducing *E. coli* 0157:H7 on the samples. Results from this study suggest that at low levels of contamination, applying 0.04% PAA as an antimicrobial in beef could be effective in reducing *E. coli* 0157:H7. However, these results do not show enough reduction in bacterial growth to use PAA as the sole method of controlling *E. coli* 0157:H7.

Keywords: beef, e. coli, peracetic acid

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051 Consumer Preference for Sirloin Steaks from Post-Extraction Algal Residue (PEAR) Fed Animals.

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A discrete choice experiment, fatty acid composition and shear force analyses were conducted evaluating consumer preferences for sirloin steaks from steers fed post-extraction algal residue (PEAR) or conventional (grain-based) feeding systems. Twelve Angus × Hereford steers (BW = 549 ± 38.8 kg) were fed PEAR at 1.0 kg OM/d or a conventional diet 35 d prior to harvest. Ninety-six consumers participated in sensory tasting panels before completing a choice set survey; 127 consumers completed only the choice set survey without sampling products. Sensory panelists evaluated beef samples from each treatment for overall preference, overall flavor, beefy flavor, and juiciness using a 9-point, end-anchored hedonic scale, where 1 = extremely dislike and 9 = extremely like. Sensory data were analyzed using randomized complete block design with panelist and consumption order as blocking factors. Survey responses were analyzed using a mixed logit model from which consumer preference, within group preference heterogeneity, and willingness to pay (WTP) were derived. Steaks from conventional and PEAR-fed steers had similar WBSF scores (1.89 kg and 2.01 kg, respectively; $P = 0.77$). Fatty acid composition differed ($P < 0.05$) only for palmitic (16:0) and nervonic acids (24:1); both were greater in steaks from PEAR-fed cattle (11% and 100%, respectively). Rating of overall preference, overall flavor like, and beefy flavor like were not different between treatments ($P > 0.26$). Panelists rated steaks from PEAR-fed cattle as juicier (6.70) than steaks from conventionally-fed cattle (5.94; $P < 0.01$). Sensory tasting of products altered consumer preferences. Consumers completing only the survey perceived beef from PEAR-fed cattle negatively compared to beef from grain-fed cattle, with a WTP discount of -$1.17/kg ($P < 0.05$). With sensory tasting, the WTP for beef from PEAR-fed cattle was not discounted relative to beef from grain-fed cattle (-$0.44/kg; $P = 0.21$). If PEAR-fed beef came to market it may not hold any potential marketing difference than beef from grain-fed cattle. Preferences were heterogeneous within respondent groups (tasting/no tasting); the same attributes are not important to all respondents. Some consumers preferred beef from PEAR-fed cattle while others preferred beef from conventionally-fed cattle. Lack of substantial chemical differences among these products indicate PEAR-fed beef can be introduced with minimal risk. Preference heterogeneity indicates an opportunity to market PEAR-fed beef as a differentiated product; however, promotional tastings may be required to remove negative perceptions among consumers.

Keywords: Beef Cattle, Post-Extracted Algal Residue (PEAR), Consumer Willingness-to-Pay (WTP)

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PASTURES AND FORAGES

052 Effects of stocking rate, forage management, and grazing management on performance and economics of cow-calf production in Southwest Arkansas.

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The objectives of this research were to determine the impacts of grazing management practices, including rotational grazing, stockpiling bermudagrass, and cool-season annual grasses on productivity and economics of spring calving cows (n = 72/yr, BW = 547 ± 33.2 kg) grazing bermudagrass pastures (n = 9, 4.7 ha). Treatments included: CG - low intensity management with continuous grazing at a moderate stocking rate (SR, 0.8 ha/cow); MR - intensive management at moderate SR (0.8 ha/cow); HR – intensive management with high stocking rates (0.4 ha/cow). Stockpiling in MR and HR was managed by fertilization of 0.2 ha/cow of bermudagrass in early August with 168 kg ammonium nitrate and deferring grazing until November. Wheat (112 kg/ha) and annual ryegrass (28 kg/ha) were established (0.2 ha/cow) in HR and MR by interseeding with a no-till drill in the fall. Cow and calf performance and economics data were analyzed by ANOVA using the mixed procedure of SAS (SAS Inst. Inc., Cary, NC) and pregnancy percentage was analyzed using GLIMMIX, pasture was the experimental unit and year the random block. Hay feeding days decreased ($P < 0.01$) from 106 ± 10.9 d for CG to 37 ± 10.9 d for HR which was further reduced ($P = 0.01$) to 15 ± 10.9 d for MR. Pregnancy percentage tended ($P = 0.08$) to be greater for HR (88 ± 3.5%) than MR (80 ± 4.6%) and CG (78 ± 4.7%) which did not differ ($P = 0.74$). Weaning weights in CG (238 ± 7.4 kg) tended ($P = 0.09$) to be greater than MR (228 ± 7.4 kg) and were greater ($P < 0.01$) than HR (220 ± 6.8 kg). However, total weaning weight per hectare was 89% greater ($P < 0.01$) for HR compared with CG and MR, which did not differ ($P = 0.31$). With rotational stocking there was the opportunity to harvest excess forage as hay in both MR and HR with a net value of $52.90/ha and $15.50/ha ± 6.99, respectively. Net returns per hectare did not differ ($P = 0.39$) between CG ($536 ± 65.82/ha) and MR (641.70 ± 65.82/ha), but were increased ($P< 0.01$) by 107% by HR ($1,221.29 ± 65.82/ha). Using rotational grazing, stockpiled bermudagrass, and complementary cool-season annual grasses can drastically reduce winter feed requirements and simultaneously increase carrying capacity and net return.

Keywords: cool-season annual grasses, cow calf, stockpiled bermudagrass, rotational grazing

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053 Supplementation Levels and Monensin Effects on Performance of Early Weaned Calves Grazing Bahiagrass Pastures.

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The objective of this study was to evaluate the effects of supplementation levels and monensin on forage characteristics and performance of early weaned beef heifers (*Bos* sp.) grazing bahiagrass (*Paspalum notatum*) pastures. The experiment was conducted in Ona, FL from April to June 2014. Treatments were the factorial combination of two supplementation levels (1.0 or 2.0% BW) with or without monensin (control) distributed in a complete randomized design with three replicates. The concentrate supplement (17% CP and 78% TDN) was fed daily. Monensin was added to the supplement at the time of feeding at the levels of 20 ppm of the estimated total DMI of the heifers. Twelve bahiagrass pastures (1.0 ha) were used as experimental units and grazed with a continuous and fixed stocking rate of 0.8 AU (animal units, 450 kg BW)/ha. The mean BW of the heifers was 171± 15 kg at the initiation of the experimental period. Herbage mass (HM) and nutritive value were measured every 14 d. Unshrunk BW of the heifers was collected every 28 d for ADG calculation. Data was analyzed using mixed models with supplementation levels, monensin, and month as fixed effects and replicates random effect. Treatments were considered different when $P \leq 0.10$. Pastures with heifers receiving 2% BW treatment had greater ($P = 0.09$) HM (4,000 vs. 4400 kg/ha) and herbage allowance ($P = 0.06$, 10.0 vs. 9.0 kg DM/kg BW). There was no effect of monensin ($P = 0.76$) on HM and HA. Supplementation levels and monensin did not affect CP ($P = 0.17$, mean = 13.8%) and IVDOM ($P \geq 0.59$, mean = 48.8%) of the pastures; however, there was a significant decrease ($P \leq 0.001$) in CP (from 16.1 to 11.7%) and IVDOM (from 53.2 to 42.7%) from April to June. Heifers receiving 2% BW supplementation had greater ADG than 1% BW ($P = 0.09$, 0.98 vs. 0.85 kg/d) and heifers receiving monensin had greater ADG than control ($P= 0.05$, 0.99 vs. 0.84 kg/d). Adding monensin to the supplement may be a feasible management practice to improve performance of early weaned beef heifers grazing bahiagrass pastures and receiving 1 or 2% BW supplementation. The viability of increasing levels of supplementation from 1 to 2% BW will be conditional to the cost of concentrate and cattle prices due to the limited increase in ADG of the heifers.

Keywords: monesin, supplement, bahiagrass

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054 In Situ Degradation Parameters of Three Chronological Maturities of _Tifton 85' Bermudagrass from Cattle Supplemented with Varying Levels of Distillers' Dried Grains.

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Dried distillers' grains (DDG), a byproduct of ethanol production, can affect the digestive and fermentative function of the rumen when supplemented to cattle. The objective of this study was to evaluate the ruminal digestion kinetics of 'Tifton 85' bermudagrass (T85; *Cynodon dactylon* [L.] Pers.) as affected by chronological forage maturity and level of DDG supplementation. Samples of T85 were harvested (16 pastures at the Texas A&M AgriLife Center, Overton, TX) in June (J), August (A) and October (O) 2014. Ruminally-fistulated steers (n = 6) were stratified by BW to 3 pens, and pens were allocated randomly to 1 of 3 levels of DDG supplementation: 0.00 (C), 0.25 (L) or 1.00% (H) BW hd^{-1} d^{-1}. The experiment was repeated across three periods in a Latin square design. Animals were pen-fed daily and offered *ad libitum* access to T85 hay for a 7 d adaptation period. Following adaptation, duplicate samples of each chronological maturity as well as a single DDG sample were inserted into the rumen of each animal and removed at 2, 4, 8, 12, 24, 72 and 96 h. Original and incubated samples were analyzed for DM, NDF and ADF. The potential degradation (PD) of DM was greatest ($P < 0.05$) from C and lowest from L, with H intermediate, and was greatest ($P < 0.05$) from J, followed by A and lowest from O. Rate of DM degradation was greatest ($P < 0.05$) from C and lowest from H, with L intermediate. There was a supplement × chronological maturity interaction for PD of NDF and ADF, but overall supplementation with DDG and maturity of T85 decreased ($P < 0.02$) PD. Supplementation of DDG may decrease PD of DM due to reduction of fiber degradation, especially at 1% BW supplementation. Reduction of DM PD is dependent upon chronological forage maturity, which may be a greater factor in fiber digestion than DDG supplementation level.

Keywords: Tifton 85 bermudagrass, DDG, in situ degradation

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055 Effect of fermented corn silage density and bacterial inoculants on corn silage pH and fermentation end products.

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Increasing density **(D)** of ensiled corn forage by proper harvest dry matter, chop length and silo packing results in decreased presence of oxygen which enhances bacterial fermentation of corn silage **(CS)**. Bacterial inoculants have been proven to improve the fermentation profile and lower the pH of CS. This research measured the effect of CS D and bacterial inoculants (**I)** on selected fermentation characteristics. From December, 2012 to July, 2013, 46 dairy operations in the Midwest USA ranging in size from approximately 300 to 4,500 cows (62,500 total) participated in a study to evaluate the effect silo density (kg/meter^3) of ensiled **CS** on the pH, lactic acid **(LA)**, total volatile fatty acids **(VFA)**, ammonia **(NH_3)**, and ethanol **(ETOH)**, all % of CS DM, of the corresponding corn silage. A minimum of at least 6 core samples from the face of CS bunkers or drive-over piles was consolidated and a sample sent to a commercial lab (Rock River Laboratories, Watertown, Wisconsin) for analysis using wet chemistry methods. Some dairies were sampled more than once as they changed sources of CS. The average D of I CS was 301 kg/meter^3 (range 231-351) and non-I CS was 280 kg/meter^3 (range174-344). The REG procedure of SAS was used to analyse the relationship between D and the dependent variables. A t-test was used to compare I and non-I. With I CS there were negative relationships between D and pH (R^2=0.13, P<0.05), NH_3 (R^2=0.24, P<0.01), and ETOH (R^2=0.09, P<0.10). There were positive relationships between D and LA (R^2=0.35, P<0.001) and VFA (R^2=0.37, P<0.001). With non-I CS there were negative relationships between D and pH (R^2=0.34, P<0.01) and NH_3 (R^2=0.36, P<0.01). I compared to non-I CS resulted in lower pH (4.01 vs. 4.30, P<0.001); NH_3 (0.93 vs. 1.05, P<0.01); ETOH (0.47 vs. 0.56, P<0.01) and higher VFA (6.59 vs 4.94, P<0.01) and LA (4.52 vs. 3.42, P<0.01). These results demonstrate that increased CS bunker/pile D measured by silage face core sampling and bacteria inoculation is strongly correlated to improved fermentation characteristics of low pH, NH_3, ETOH and high VFA and LA concentrations. This work demonstrates the importance of high D and bacterial inoculation on improving the fermentation quality of CS.

Keywords: Corn Silage, Ensiling, Density

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056 Stocker cattle performance from grazed stockpiled 'Tifton 85' bermudagrass.

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Stockpiled bermudagrass (*Cynodon dactylon* L.) can potentially reduce winter feeding costs in cow-calf operations, but few studies have been conducted with stocker cattle. The NRC (2000) suggests that the energy and protein requirements of growing animals may exceed that provided by stockpiled warm-season forage alone. However, stockpiling may provide an alternative to hay use prior to the availability of cool-season annuals for fall-purchased stocker cattle. For this reason, a late fall/early winter grazing study was conducted to determine the effectiveness of using stockpiled 'Tifton 85' (T85) bermudagrass with or without supplementation as a replacement for hay during the receiving period for growing steers. Beginning on November 11, 2014, 30 steers (mean initial BW 283 kg) were randomly assigned to replicate (n=2) 0.76-ha paddocks (5 steers per paddock) of stockpiled T85 bermudagrass that had been cut on August 22, 2014 and fertilized with 56 kg N/ha. Steers were unsupplemented (T85 alone) or provided a 75:25 (SUPPL 1) or 50:50 (SUPPL 2) mixture of soybean hulls and cottonseed meal, respectively, at a rate of 0.9 kg/d for 60 days. Frontal grazing was used to allocate strips of ungrazed forage to steers every 3 to 4 days by moving polytape based on total forage mass, animal DM requirements, and expected forage waste. Forage productivity, allowance, nutritive value and animal performance data were analyzed as a completely randomized design using PROC MIXED of SAS. Over the 60-d period, steers grazing stockpiled T85 without supplement had greater weight loss (-0.52 kg/d; $P = 0.0536$) than supplemented steers (-0.14 and - 0.15 kg/d for SUPPL 1 and 2, respectively). However, there was no significant difference in ADG between supplement types ($P > 0.10$). Mean forage mass (4,937 kg DM/ha), forage allowance (3.5 kg DM/kg steer BW), and forage utilization (84%) did not differ among treatments ($P > 0.10$). Forage nutritional value decreased ($P < 0.10$) from 60.8% TDN and 8.7% CP in November to 55.8% TDN and 6.5% CP by early December. Declining forage nutritional value is partially attributed to above average rainfall in December 2014 (20 cm) compared to the 30-yr average (13 cm), increasing the deterioration of standing forage. Previous studies have shown that stockpiled T85 bermudagrass can maintain cow/calf pairs; however, following 1-yr of evaluation, results suggest that stockpiled T85 requires more specific supplementation strategies for stocker cattle to overcome declining nutritional value during the early winter.

Keywords: Stockpiling, Tifton 85, Stockers

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057 Effects of bambermycin or monensin on performance of growing steers grazing wheat pasture.

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Growing steers and bulls, were received in 3 blocks to evaluate the effects of receiving supplements containing bambermycin (Gainpro; Huvepharma, Inc., Sofia Bulgaria) or monensin (Rumensin; Elanco Animal Health, Indianapolis IN) on cattle morbidity and performance. Following receiving, steers were allocated to wheat pastures based on previous treatment and bodyweight. Wheat pastures in Block 1 (n = 29, 1.6 ha) were stocked at 2.5 steers/ha (n = 116, BW = 244.5 ± 17 kg) and in Blocks 2 and 3, (n = 50, 0.8 ha) were stocked at 5 steers/ha (n = 199, BW = 243.5 ± 22 kg). Steers received free choice mineral designed to supply 200 mg/d of monensin (MON), 20 mg/d bambermycin (BAM), or non-treated mineral (CON). Full weights were taken on 2 consecutive d at initiation and terminating of grazing and at 28 d intervals. Data were analyzed using the mixed procedure of SAS as a randomized complete block design. Initial grazing BW were not different ($P = 0.74$) for the CON and BAM treatments (241.3 ± 20 kg) but were less ($P < 0.01$) than MON (249.5 ± 20 kg). Body weight continued to be greater ($P < 0.01$) for the MON group on d 28, d 56, and at the completion of grazing. The CON and BAM BW did not differ ($P \geq 0.14$) throughout the study. At the end of grazing, MON (347 ± 24.4 kg) weighed 17.2 kg more than CON (329.8 ± 24.4 kg) and 13.6 kg more than BAM (333.8 ± 24.4 kg). During the initial 28-d grazing period, MON (1.0 kg/d) and CON steers (0.99 kg/d) had ADG that exceeded ($P < 0.01$) BAM (0.79 kg/d) by 0.2 to 0.22 kg/d. The ADG from d 28 to d 56 were not different ($P = 0.88$) for CON and BAM (1.7 kg/d) but were 0.1 kg/d less ($P < 0.01$) than MON (1.8 kg/d). From d 56 to end of grazing there was no difference in ADG ($P = 0.20$) but performance of MON and BAM were numerically 0.09 kg/d greater than CON. Overall ADG were not different ($P = 0.42$) for CON (1.24 kg/d) and BAM (1.27 kg/d) but were 10% greater ($P \leq 0.05$) for MON (1.37 kg/d). Self-fed mineral supplements containing MON increased ADG and BW by 10% over CON, while BAM did not affect animal performance over CON throughout grazing.

Keywords: Bambermycin, Monensin

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058 Virginia wildrye as an alternative to annual ryegrass and wheat for grazing stocker beef steers.

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The perennial grass, Virginia wildrye (*Elymus virginicus* L.) (WR), was evaluated as an alternative to two annual grasses, annual ryegrass (*Lolium multiflorum*) (ARG) and wheat (*Triticum aestivum*) (WHT), as pasture for grazing beef calves. Replicated (n = 3) 2.02-ha paddocks of WR, 'Marshall' ARG, and 'EK102' WHT monocultures were established in September 2014 in randomized design at the Mississippi Agricultural and Forestry Experiment Station Prairie Research Unit in Prairie, MS. The WR, ARG, and WHT seed were no-till drilled at seeding rates of 16.8, 33.6, and 112.1 kg/ha, respectively, into Houston clay soils. Each pasture received a 27.2 kg/ha application of actual nitrogen as ammonium nitrate in October 2014. Weaned Angus crossbred steer calves (n = 36, BW = 280.1 ± 5.5 kg) were stratified by BW and assigned into 9 groups of 4 calves. The steer groups were each randomly allocated to one of the pasture replications. Steers began continuous grazing of paddocks on April 8, 2015 for a 56-day period. All steers had unrestricted access to water and a complete loose mineral and vitamin supplement. Steers were weighed on two consecutive days at the start and end of grazing and at d 28 during the grazing period. Data were analyzed using PROC MIXED of SAS with $P < 0.05$ used to separate least square means. Steer ADG was greater ($P < 0.02$) for ARG (1.29 ± 0.08 kg/d) compared with WR (1.02 ± 0.08 kg/d). Steer ADG was not different ($P = 0.55$) between WR and WHT (1.08 ± 0.08 kg/d); nor was ADG different ($P = 0.07$) between ARG and WHT. Initial results suggest that, under a constant stocking rate, WR is comparable to WHT, but there is an ADG advantage for ARG over WR in stocker cattle during a spring grazing period. A second year of data collection will further evaluate steer growth performance grazing these various cool-season grasses.

Keywords: wildrye, annual ryegrass, wheat

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059 Distiller's grains as a substitute for fertilizer in summer grazing systems: performance, nitrogen recovery, and profit.

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Stocker cattle producers seek to maximize net income by optimizing inputs, and capturing more input nitrogen (N) from warm-season pasture systems may simultaneously improve income and reduce nitrogen runoff. Each summer for 4 yr, stocker cattle were grazed on 12 pastures of yellow bluestem (*Bothriochloa ischaemum*) to compare efficiency of N input types. Three pastures were assigned to each of 4 treatments. Control (CON) pastures were stocked at 318 ± 32 kg initial BW/ha and received minimal N inputs. The remaining nine pastures were stocked at 642 ± 36 kg initial BW/ha. Three of those pastures received corn distillers dried grains (DDGS) supplement at 0.75% of BW/d. Three other pastures were fertilized with 90 kg/ha of actual nitrogen as urea (N+), and the final three received nitrogen and 39 kg/ha actual phosphorus fertilizer (N+P). Stockers (239 ± 21 per yr; steers or heifers) were grazed for 109 ± 27 d, as adequate forage was available (grazing period and stocker sex was constant across pastures within year). Stockers in non-DDGS pastures received 0.45 kg/d of a 40% CP supplement plus monensin during the later half of the grazing season to meet their CP requirement. Response to treatment was modeled with yr as a random effect. DDGS pastures produced greater ADG, gain per hectare, and net return. Due to low stocking rate, CON pastures produced the least gain per ha; low inputs also resulted in greater N recovery in CON pastures. In this analysis, DDGS supplementation improved N recovery compared with fertilizer inputs, and DDGS was the most cost effective input, however stocker producers must continuously evaluate input options in response to market price fluctuations.

Table 059.

Item	CON	N+	N+P	DDGS	SEM
ADG, kg/d	0.86[a]	0.80[a]	0.86[a]	0.98[b]	0.128
Gain, kg/ha	115[a]	212[b]	228[b]	258[c]	23.9
N recovery[1], %	33[a]	6[b]	5[b]	17[c]	1.7
Return[2], $/ha	97[a]	213[b]	196[b]	306[c]	48.6

[1]Calculated as nitorgen (N) retention in steer gain per NRC (1996) divided by N inputs, including atmospheric nitrogen deposition.

[2]Gain/ha * $2.2/kg - (DDGS kg * $0.18/kg + N fertilizer kg * $1/kg + P fertilizer kg * $1.3/kg + 40% CP kg * $0.22/kg; as appropriate) - $150/ha.

[a,b,c]Within a row, means lacking a common superscript differ ($P < 0.05$).

Keywords: supplement, fertilizer, bluestem

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PHYSIOLOGY I

060 Ergot alkaloid induced vasoconstriction of bovine uterine and ovarian blood vessels.

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Fescue toxicosis is a disease common in cattle grazing tall fescue (*Festuca arundinacea*) containing an endophytic fungus (*Epichloë coenophiala)* that produces ergot alkaloids. Ergot alkaloids cause vasoconstriction to the extremities, however it remains undetermined how blood flow to the reproductive organs are affected.

Therefore, the objective of this study was to determine if ergot alkaloids from endophyte-infected fescue reduces blood flow to the reproductive organs thus hindering reproductive functions. Angus heifers (n=36) naïve to ergot alkaloids were placed in Calan gates and were randomly assigned to receive either endophyte-infected fescue seed (EI) or non-infected fescue seed (EF; control) for 75d. Weekly measurements were taken to monitor the heifer's growth and performance. Reproductive measurements, including ovarian structures, diameter of uterine (UT) and ovarian (OV) artery and veins, and hormone analysis were collected after 30d of exposure to ergot alkaloids. Following estrous synchronization, ovarian measurements and blood samples were taken at 0, 5, 10 and 17 d of the estrous cycle. Data were analyzed using repeated measure in the PROC MIXED procedure of SAS. Average daily gain was decreased for the EI group (0.8 kg/d) compared to EF heifers (1.0 kg/d; $P<0.05$). Body condition scores were greater in EF heifers compared to the EI group ($P=0.053$). Furthermore, hair coat and shedding scores were greater in EI heifers compared to EF heifers ($P<0.05$). Heart rate, rectal temperature, respiration rate, and blood pressure did not differ ($P>0.05$). Vasoconstriction occurred in the caudal artery, but not the caudal vein, of heifers exposed to the EI fescue seed ($P<0.05$). No differences were observed in antral follicle counts or CL area. Circulating progesterone concentrations tended to be lower in EI heifers compared to EF heifers ($P<0.1$). Vasoconstriction occurred in the UT artery (P<0.05; 109 vs. 80.6 cm^2 for EF, and EI, respectively) and UT vein (P<0.05; 116.9 vs. 93.1 cm^2 for EF, and EI, respectively) of heifers exposed to the EI fescue seed from d 10 through 17 of the estrous cycle. Likewise, there was a significant decrease in OV artery ($P<0.05$; 15.8 vs. 12.0 cm^2 for EF, and EI, respectively) and OV vein ($P<0.05$; 18.6 vs. 13.6 $cm^2$for EF, and EI, respectively) diameter in the mid to late estrous cycle. This reduction in blood flow to the reproductive organs during the critical period of maternal recognition of pregnancy may contribute to the reduced pregnancy rates associated with fescue toxicosis.

Keywords: fescue toxicity, vasoconstriction, reproductive tract

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061 Sexually dimorphic innate immune responses but not tissue Salmonella translocation patterns in pigs exposed to an oral Salmonella challenge.

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Sexually dimorphic innate immune responses have been observed in several species, but have not been studied in response to a live pathogen challenge in pigs. This study aimed to elucidate sexually dimorphic innate immune responses along with *Salmonella* translocation patterns in newly weaned pigs orally inoculated with *Salmonella*. Newly weaned pigs (n=8 gilts and 12 barrows; 6.2±0.2 kg BW) were obtained from a commercial swine facility and were maintained in an environmentally-controlled facility in individual pens equipped with feeders and nipple waterers. Pigs were allowed *ad libitum* access to a commercial non-medicated starter ration and water throughout the study. On d12, pigs were anesthetized to allow placement of a temperature measuring device (TEMP) in the abdominal cavity. On d17, pigs were anesthetized and fitted with indwelling jugular vein catheters. On the following day (d18), pigs were orally inoculated with $4.7x10^9$ *Salmonella* Typhimurium. Blood samples were collected at 0.5-h intervals from -2 to 8 h, and at 8-h intervals from 8 to 72 h post-challenge. Whole blood was analyzed for complete blood cell counts using a ProCyte Dx Hematology Analyzer. Serum was isolated for measurement of cortisol. Following collection of the 72 h sample, pigs were humanely euthanized and tissues were collected for *Salmonella* isolation. There was a sex by time interaction ($P<0.001$) for TEMP such that gilts had a greater TEMP response to the *Salmonella* challenge compared to barrows. There was also a sex by time interaction ($P=0.03$) for serum cortisol with gilts having decreased cortisol at 16h yet greater cortisol at 32h than barrows. Barrows had greater total white blood cells (17.8 vs. 16.2±0.4 10^3 cells/μL; $P<0.01$; respectively) and neutrophils (7.8 vs. 6.1±0.4 10^3 cells/μL; $P<0.01$; respectively) than gilts. However, gilts had greater lymphocytes (9.6 vs. 9.0±0.2 10^3 cells/μL; $P=0.05$; respectively) than barrows. While immune parameters were influenced by sex, there were no effect of sex ($P>0.05$) on *Salmonella* concentrations from fecal shedding 4 d post-inoculation, in the cecum, mesenteric and subiliac lymph nodes, liver, spleen, gallbladder, or kidney tissues. These data demonstrate that weaned gilts produced a stronger immune response to a *Salmonella* challenge compared to barrows, without affecting the tissue translocation or shedding of *Salmonella*.

Keywords: Innate immunity, *Salmonella*, sexual dimorphism

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062 Influence of sex and temperament on response of Brahman calves to Salmonella Newport Extract vaccine.

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The effect of sex and temperament on response of Brahman calves to a *Salmonella* vaccine was studied. Exit velocity (m/

Table 062.

	BW d0 (kg)	BW change d0-28 (kg)	BW change d0-56 (kg)	Cortisol (ng/mL)	Ig ratio
Female	192.6[a]	-0.55	5.53[a]	33.11[a]	0.54[a]
Male	203.6[b]	-0.31	9.21[b]	25.67[b]	0.48[b]
Calm	199.6	0.24[ab]	7.77	23.47[a]	0.57[a]
Intermediate	198.8	0.54[a]	8.16	27.87[b]	0.46[b]
Temperamental	195.8	-2.07[b]	6.20	36.86[c]	0.50[b]

sec) and pen score (1=calm and 5=excitable) recorded 28 d pre-weaning were used to assign temperament classes (calm, n=29; intermediate, n=27; temperamental, n=35). Calves, stratified by sex and temperament, were assigned to non-vaccinated (control, n=45) and vaccinated (vaccinated, n=46) groups. Vaccinated calves received *Salmonella* Newport Extract vaccine (2 mL subcutaneous; Zoetis, Florham Park, NJ): at weaning (d0) and 28d after weaning. Body weight (BW) was recorded on d0, 28, and 56 and blood samples were taken at 7-d intervals to determine serum cortisol concentration by RIA and Ig ratio specific to vaccine by ELISA (Epitopix, Willmar, MN). Age and BW data were analyzed with mixed model procedures of SAS; sex, temperament, and vaccination treatment were included as fixed effects. Age at weaning did not differ between treatments (P=0.35; 185±3.3 d). Bulls were heavier at d0 (P=0.06) and gained more weight from d0 to 56 (P=0.01) than heifers. Temperament did not affect d0 BW (P=0.84) or BW gain from d0 to 56 (P=0.46), but did affect BW change from d0 to 28 (P=0.06). Vaccination did not affect BW change during the experiment (P>0.88), so only vaccinated calves were used in the remaining analysis. A specific Ig profile of each calf was assessed for peak height in response to initial (Ig1; d0 to 21) and booster vaccination (Ig2; d28 to 56) and the days these occurred (referred to as Ig1d, Ig2d). Neither sex (P>0.06) nor temperament (P>0.33) influenced peak Ig1 (0.57±0.05), peak Ig1d (17±1.04 d), peak Ig2 (0.94±0.04), or peak Ig2d (46±1.9 d). Cortisol and Ig ratio during the experiment were analyzed as repeated measures; the models included sex, temperament, and day as fixed effects. Heifers had greater cortisol and Ig ratios (P<0.05) than bulls. Calm calves had greater Ig ratios (P=0.01) than other temperament classes. Sex and temperament of Brahman calves affected cortisol concentration and adaptive immune response to *Salmonella* Newport Extract vaccine.

Keywords: *Salmonella*, temperament, sex

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063 Effects of energy intake during the breeding season on beef heifer performance, endocrine profiles, and oocyte transcript levels synchronized for artificial insemination.

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Thirty-three Angus-cross beef heifers (initial BW = 380 ± 23.8 kg, age = 441 ± 10.5 days) were used to determine if supplementing energy to an annual ryegrass (*Lolium multiflorum*; DM = 90.4%, CP = 10.4%, ADF = 41.1%, NDF = 63.7%, TDN = 56.8%) hay diet at 2 nutrient requirement levels (1M = maintenance or 1.3M = 1.3 × maintenance) during the breeding season would impact performance, endocrine profiles, and cumulus oocyte complex (COC) transcript levels for adiponectin. Heifers were synchronized on d 0 with the CO-Synch + CIDR (controlled intravaginal drug release) protocol and an Angus bull was turned out 10 d post AI for a 70-d breeding season. On d 0, all heifers were stratified by age and BW and fed either 0.91 kg/d per hd (1M = 17 hd) or 2.72 kg/d per hd (1.3M = 16 hd) of dried distillers grain for 64 d. Body weights were recorded on d 0, 38, 64 and 104 (weaning). Blood samples were collected from all heifers on d 0, 38, and 64 for analysis of adiponectin, leptin, and IGF-1. At each blood sampling, COCs were collected from ovaries from 19 (1M = 10 and 1.3M = 9) heifers and analyzed for adiponectin transcript levels. Pregnancy to timed-AI and final pregnancy rates were determined on d 43 and 104 post AI. Data were analyzed using Proc GLM for performance, Proc Mixed for repeated measures, and Proc Genmod for pregnancy data with diet analyzed as a fixed effect and d 0 BW as a covariate. Body weight on d 38, 64, and 104 was greater ($P \leq 0.02$) for 1.3M compared with 1M heifers; however, AI and final pregnancy rates did not differ ($P \geq 0.60$) among feeding groups. There was no treatment by sample day interaction ($P \geq 0.21$) for adiponectin, leptin, or IGF-1 concentration. Adiponectin concentration tended to be lower ($P = 0.06$) in heifers in the 1.3M compared with 1M group; however, leptin and IGF-1 concentrations were similar ($P \geq 0.25$) among treatment groups. Differences in adiponectin transcript levels in COCs were not observed ($P \geq 0.20$) among collection dates. Supplementing heifers at 1.3M with an energy source during the breeding season increased heifer BW over time. Adiponectin appeared to be affected by energy level fed; however, because differences in transcript levels were not detected, more research is needed.

Keywords: beef heifers, endocrine profile, oocytes

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Table 064.

Group	Starting BW (kg)	Starting BCS	Total Supplementation ADG (kg)	Total Supplementation BCS change	% of cows with at least 15 follicles
Control	555.4	6.0	-0.38	-0.86	79[a]
Monensin	551.8	5.9	-0.49	-0.88	96[b]

064 Effect of monensin supplementation on Brahman cow performance and postpartum follicular development.

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The purpose of this study was to evaluate the effects of monensin on Brahman cow performance and ovarian follicle dynamics at 21 d postpartum. Multiparous pregnant cows (n = 56) were stratified by age at first calving, BCS, predicted calving date, and age into two groups that were then pastured separately and provided Coastal bermudagrass hay ad libitum. Each cow was fed 1.54 kg/d of a pelleted concentrate (61.2% corn gluten feed, 35.3% cotton seed meal, and 3.5% binders and lubricants) without monensin (control group) or with 200 mg monensin/d (monensin group). Supplementation began no less than 21 d before each individual predicted calving date and continued until return to estrous cyclic activity or 60 d postpartum, whichever occurred first. Supplementation length did not differ between groups (P = 0.74; 94.45 ± 2.84 d). Ultrasonography was performed at d 21 postpartum (SonoSite M-Turbo with 7.0 MHz L52X transducer) to assess each ovary for the largest follicle, second largest follicle, population of follicles ≥ 4 mm in diameter, and total follicular population. Continuous data were analyzed using mixed model procedures of SAS with treatment as a fixed effect and cow age as a covariate. Calf sire was included as a random effect for calf birthweight. Treatment did not affect calf birthweight (P = 0.40), cow ADG (P > 0.16) or BCS change (P > 0.68) during prepartum, postpartum, or total supplementation periods. Follicular diameter and populations were analyzed using the frequency procedure and separated using chi-square analysis of SAS. Addition of monensin increased the percent of cows with at least 15 follicles (P = 0.05; control = 23/29 vs monensin = 26/27) and tended (P = 0.13) to increase the percent of cows with at least 10 follicles that were ≥ 4 mm in diameter (control = 17/29, 59% vs monensin = 21/27, 78%). Inclusion of monensin to the corn gluten, cottonseed meal based supplement provided to Brahman cows from late gestation through 21 d postpartum enhanced follicular populations without altering cow or calf growth performance.

Keywords: Monensin, folliculogenesis

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065 Ergot alkaloid inhibition of cytochrome P450 activity.

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Endophyte-infected tall fescue has been associated with several ergot alkaloid-related toxicological conditions and have resulted in severe economic losses in livestock production. Ergot alkaloids are metabolized in part by cytochrome P450 (CYP) enzymes. Sensitive luminescent assays can assess CYP activity inhibition by various chemicals including ergot alkaloids. Our objective was to determine inhibitory concentration 50 (IC50) of bromocriptine (BC), dihydroergatomine (DHET), ergotamine (ET) and ergonovine (EN) on CYP450 enzyme activity using the P450-glo™ CYP3A4 screening system (luciferin-PPXE; Promega, Madison, WI). Each alkaloid was dissolved in methanol and diluted to 0, 1.56, 3.12, 6.25, 12.5, 25, and 50 µM and air dried in 96-well plate reaction wells. Following manufactures instructions, reagents were mixed, incubated, and luminescence determined. Luminescence data were converted to percent of CYP activity with no alkaloid present. Relative inhibition of CYP activity by alkaloids was analyzed using mixed models analysis of variance. Main affects were alkaloid, concentration, and the interaction of alkaloid and concentration. Means were separated using multiple t-tests with Tukey's adjustment. Three alkaloids (BC, DHET and ET) had concentration-dependent inhibition ($P<0.05$) of CYP activity; however, EN did not inhibit ($P>0.05$) CYP activity. The first concentration that inhibited CYP activity was 1.56, 6.25, and 6.25 µM, respectively for BC, DHET, and ET. The IC50 for BC, DHET, and ET were 1.35, 8.5, and 5.5 mM, respectively. Overall, BC was the most potent ($P<0.01$) with an IC50 =1.35 mM. Mixtures of alkaloids did not ($P>0.05$) result in additive effects on CYP activity. Our findings confirm the inhibitory effects of ergot alkaloids on CYP activity, and establish IC50 for three alkaloids. Hepatotoxicity induced by ergot alkaloids associated with tall fescue leads to poor animal performance and severe economic losses. In the future, the P450-Glo assay may be useful in identifying animals or management practices that prevent or minimize ergot alkaloid poisoning of livestock.

Keywords: *Ergot alkaloids, fescue*, *CYP450*

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Table 066. Glucose and insulin response variables to a glucose challenge in PNS and Control bulls.

Variable	Treatment Group		
	Control	Prenatal Stress	*P*-value
Peak Insulin, μIU/mL	101.7 ± 14.8	75.8 ± 14.8	0.23
Time to peak insulin, min	20.8 ± 1.3	20.0 ± 1.3	0.09
Time to return to basal insulin, min	151.5 ± 8.1	132.5 ± 8.2	< 0.01
Total area under the insulin response curve, μIU • min • mL^{-1}	6,690 ± 208	5,595 ± 208	< 0.01
Total area under the glucose response curve, μIU • min • mL^{-1}	16,687 ± 165	17,491 ± 165	< 0.01

066 Influence of prenatal stress on insulin response to a glucose challenge in yearling Brahman bulls.

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We hypothesized that stressing cows during gestation (prenatal stress, PNS) would increase the insulin sensitivity of their progeny. Specifically, 12 prenatally stressed (dams transported for 2h on d 60, 80, 100, 120, and 140 of gestation) and 12 Control (dams not transported) yearling bulls of similar BW (298.50 ± 5.95 kg) and balanced for temperament (4 temperamental and 8 calm per group) were subjected to an iv glucose tolerance test to compare insulin responsiveness and glucose clearance. Following 12 h off feed the bulls were fitted with jugular vein catheters and placed in individual stanchions. After a 2h acclimation period, bulls were administered a glucose tolerance test (0.5 mL/kg BW of 50% dextrose solution). Blood samples were collected at 10min intervals for 40 min and then at 20min intervals until 180 min post-challenge. Serum concentrations of glucose and insulin were determined by enzymatic assay and ELISA, respectively. Data were analyzed using mixed models procedures of SAS with repeated measures. Basal concentrations of insulin (P< 0.53) and glucose (P< 0.35) were not affected by PNS. Serum insulin increased in both CON and PNS bulls within 10 min of glucose administration with a tendency for PNS bulls to reach the insulin peak earlier (P= 0.09) and return to basal insulin earlier (P< 0.01) than CON bulls (Table 066). Glucose concentration wasn't affected by treatment (P= 0.14) or by the interaction of treatment by time (P= 0.53). Time to reach basal glucose concentration was unaffected by treatment (P= 0.73). The area under the response curve was greater for glucose (P< 0.01) and lower for insulin (P< 0.01) in the PNS bulls compared to CON bulls. The insulin to glucose ratio was lower (P<0.06) in PNS bulls.These results support our hypothesis that PNS increased sensitivity to insulin.

Keywords: Prenatal Stress; Insulin; Cattle

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067 Effect of trace mineral source on postweaning *Bos Taurus* beef bull sexual development.

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The objective was to evaluate the effect of postweaning trace mineral (TM) source on sexual development in Angus (n = 9) and Aubrac (n = 5) bulls. Bulls (231 ± 4 d, 260 ± 5 kg, n = 14, 7 per TM) were randomly assigned to TM (inorganic as salt sulfates, ING; organic as Se-yeast and proteinates, ORG) based on sire, age and weaning BW. Bull diet included cracked corn, cottonseed hulls, a protein pellet and the TM supplement (0.4 kg•$^{-1}$454 kg BW•$^{-1}$d in a pellet). Weekly BW and bi-weekly semen collection, scrotal circumference (SC) and BCS (scale 1-9) were recorded. Semen collection initiated when SC was 26 cm. Puberty was defined as an ejaculate with sperm concentrations ≥ 50 × 10^6 cells/mL and ≥ 10 % motility. Sexual maturity (n = 8, 4/TM) was defined as passing a breeding soundness exams per Theriogenology guidelines. Statistical analysis used PROC MIXED of SAS with the fixed effect of TM for puberty and maturity data. Data are presented as LSM ± pooled SE. At puberty, age (345 vs 343 ± 13 d, P = 0.91), BW (369 vs. 386 ± 25 kg, P = 0.63), BCS (4.9 vs. 4.8 ± 0.2 P = 0.75) and SC (29.3 vs. 29.6 ± 0.7 cm, P = 0.74) were similar between ING and ORG, respectively. At puberty, sperm concentration was numerically greater (P = 0.39) for ORG (116.79 ± 20.23 × 10^6 cells/mL) compared to ING (91.07 ± 20.23 × 10^6 cells/mL). At sexual maturity, ING had numerically greater (ING = 322.6, ORG = 200 ± 88.43 × 10^6 cells/mL, P = 0.37) sperm concentration. At sexual maturity, ORG (399 ± 9 d) bulls tended (P = 0.10) to be younger compared to ING (424 ± 9 d) bulls, while BW (478 vs. 467 ± 41 kg, P = 0.86), BCS (5.3 ± 0.3 P = 1.00) and SC (33.4 vs. 31.1 ± 1.1 cm, P = 0.19) were similar between ING and ORG, respectively. Sperm motility tended (P = 0.10) to be greater for ORG (42.5 ± 2.7 %) compared to ING (35.0 ± 2.7 %) at sexual maturity. Bull pubertal traits were not affected by TM source. However, TM source may shorten the time it takes bulls to reach sexual maturity.

Keywords: trace minerals, puberty, sperm, bull

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068 Utilization of resynchronization as a strategy to increase the percentage of replacement beef heifers conceiving to artificial insemination (AI) after an initial fixed-time AI (TAI).

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Our objective was to develop a strategy to increase the percentage of replacement beef heifers conceiving to AI after an initial TAI. Treatments were applied to heifers of unknown pregnancy status to resynchronize estrus or ovulation of nonpregnant heifers. Previously inseminated replacement beef heifers were randomly assigned to one of two treatments 12 d after an initial TAI: 1) on d 22 heifers received a 100-µg injection of gonadotropin releasing hormone (GnRH) and a CIDR containing 1.38 g of progesterone, followed by CIDR removal and transrectal ultrasound pregnancy diagnosis on d 29. Nonpregnant heifers received a 25-mg injection of prostaglandin $F_{2\alpha}$ (PGF) followed by TAI 54 h later on d 31 (TRT1; n = 638); 2) on d 12 all heifers received a CIDR, which was removed on d 19 when an estrus detection patch (Estrotect, Rockway, Inc. Spring Valley, WI) was affixed to the tailhead of each heifer. On d 21 and 22, heifers with an activated estrus detection patch received AI and all heifers without an activated patch by d 22 received GnRH and a CIDR, followed by the same protocol as described in TRT1 from d 29 onwards (TRT2; n = 678). A second ultrasound diagnosis occurred on d 60 to determine pregnancy status and conceptus age. Pregnancy rate to the initial TAI (43.4% and 41.1% for TRT1 and TRT2, respectively) and overall pregnancy rates to AI (58.4% and 59.1% for TRT1 and TRT2, respectively) did not differ ($P > 0.05$) between treatments. In TRT1, of the 384 nonpregnant heifers exposed to a second TAI, 35.9% were pregnant. In TRT2, 226 heifers received AI as a result of activated patches with a resulting pregnancy rate of 36.7%, whereas the pregnancy rate of the 150 nonpregnant heifers that did not have activated patches and were exposed to a second TAI was 32.0%. The mean expected calving date during the subsequent calving season of all heifers pregnant to AI did not differ ($P > 0.05$) between treatments (10.6 ± 2.0 d and 8.9 ± 2.1 d, for TRT1 and TRT2 respectively). We conclude that resynchronization of estrus or ovulation of nonpregnant heifers previously exposed to TAI increased the percentage of heifers conceiving to AI, but inclusion of additional estrus detection prior to pregnancy diagnosis failed to increase AI pregnancy outcomes.

Keywords: Artificial insemination, heifer, resynchronization

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069 Yeast probiotic supplementation mitigates some of the negative effects of heat stress in feedlot heifers.

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Heat stress (HS) in feedlot cattle can be detrimental to performance, health and profitability; however, utilization of feed additives has the potential to mitigate some of these negative effects. Therefore, this study was designed to determine if supplementation of a combination live yeast and yeast cell wall product in feed could mitigate the negative impacts associated with HS. Crossbred, phenotypically similar beef heifers (n=32; BW=385±43 kg) were divided into 2 pens in which one pen was fed a standard finishing ration (CON), and the other was fed the same ration plus supplemented via top dress with a combination of a live yeast (1.5 g/hd/d) and yeast cell wall product (2.5 g/hd/d; YEAST; Phileo Lesaffre Animal Care, Milwaukee, WI). After 50 d of supplementation, cattle were transported to an environmentally controlled facility and placed in individual stanchions where indwelling jugular catheters and vaginal temperature (VT) loggers were inserted. Heifers were kept in thermoneutral (TN) conditions for 48 h (temperature-humidity index ~67; THI) then were subjected to HS for 4 d (THI~80). From d 2 to 6, hourly blood samples were collected for serum isolation from 1400-1800 h and again from 2200-0200 h which represented the targeted peak and nadir of THIs over the 5-d period. A whole blood sample was collected twice daily at 1400 and 2200 h for complete blood counts (CBC). Data collected included BW, water intake, respiration rate (RR; measured at 1600 and 2400 h daily) and serum cortisol, glucose and NEFAs. There was no change in BW (P=0.14) or ADG (P=0.53) between the treatments during the heat stress. Yeast supplemented heifers exhibited decreased VT during HS (P<0.01). There was no difference in water intake during the TN phase (P=0.25); however, YEAST heifers consumed more water/h (P<0.01) and had increased drinking bouts (P<0.01) during HS. Respiration rates were similar (P=0.21) during TN, but YEAST heifers tended (P=0.09) to have decreased RR during HS. There were no differences between treatments when evaluating hematology. There was a tendency (P=0.08) for increased cortisol in the CON heifers during HS; however, glucose (P=0.38) or NEFA (P=0.70) concentrations did not differ. In summary, supplementation of live yeast and yeast cell wall products to feedlot heifers may mitigate some of the negative effects associated with HS in feedlot cattle.

Keywords: heat stress, yeast, beef

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Table 070. Mean and SE of the age (d) at calving the 2nd; 3rd and 4th offspring. [a;b;c] = $P<0.05$ differences by column

Maturity Level	Age at 2nd calf	Age at 3rd calf	Age at 4th calf
Early	1257.0±16[c] (n=49)	1661.7±24[c] (n=35)	2028.6±37[b] (n=24)
Intermediate	1387.7±19[b] (n=34)	1836.1±28[b] (n=25)	2206.6±39[b] (n=21)
Late	1501.1±11[a] (n=92)	1918.3±18[a] (n=61)	2303.6±29[a] (n=39)

070 The influence of age at first calving on productivity of Brahman females.

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We hypothesized that age at first calving affects the productivity of Brahman cows. The objective of this study was to determine the effect of age at first calving on productivity of Brahman cows. Calving and weaning records (180 d Adj WW) of Brahman cows (n=175) born from 2005 to 2010 and exposed, as yearlings, to fertile bulls continuously until pregnancy were analyzed, cows that failed to conceive in two subsequent breeding seasons were removed. Cows that calved by 800 d of age were defined as early maturing (EM). Cows that calved between 801 and 900 d of age were intermediate (IM) and cows that calved at >900 d of age were late maturing (LM). The data were analyzed by PROC CORR and PROC MIX of SAS. Age at first calving was correlated (r=0.43; P<0.001) with age at 4th calving and with the cumulative kg of calf weaned by 5 yr of age (r-0.21, P<0.05). The number of calves weaned by 5 yr of age was negatively correlated (r=-0.31; P<0.001) with age at 1st calving and positively correlated with cumulative kg of calf weaned by 5 yr of age (r=0.91; P<0.001). Age at 4th calving did not differ between LM (2303.64±29.20 d) and IM (2206.05±39.79 d) but both were significantly older (P<0.05) than EM (2028.58±37.22 d) cows. The interval between the 1st and 2nd calving was similar (P<0.05) for the EM (491.94±16.46 d) and LM cows (460.08±12.01 d), but was greater (P<0.05) in IM cows (553.53±19.76 d). The calving interval between the 3th and 4th calving did not differ among groups. At 5 yr of age the cumulative kg of weaned calf per cow was significantly greater (P<0.05) in EM (537.48±20.18 kg) than in LM cows (455.47±13.95 kg). These results demonstrate that Brahman cows that calve at 2 yr of age are more productive than LM because they were younger at their 4thcalving and by 5 yr of age they weaned more kg of calf.

Keywords: Age sexual maturity; productivity; Brahman Cattle

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PHYSIOLOGY II

071 Comparison of plasma and hair cortisol concentrations in hair sheep ewes and lambs in response to weaning with or without fence line contact.

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This study was designed to evaluate the impact of weaning on plasma and hair cortisol concentrations of St. Croix White hair sheep. Ewes and lambs were assigned to treatments of weaning at 120 d of age with fence line contact (FL, n = 15 lambs, 10 ewes) or no contact (NFL, n = 15 lambs, 11 ewes) between ewes and lambs based on litter size and sex of lambs. On d 1 ewes and lambs were placed in a pen with shade but no feed or water. On d 2 lambs were separated from the ewes and put in a pen with feed, hay and water adjacent to the ewes (FL) or 10 m distant with no visual contact (NFL). The ewes remained in a pen without feed or water. On d 3 the ewes were returned to pasture. Lambs remained in pens for 1 wk until they were placed in a pasture with contemporary lambs. Ewe and lamb jugular blood samples were collected on d 1, 2, 3 and 28 and plasma was harvested and stored at -20 ºC until analyzed for cortisol concentration by RIA. On d 1 and 28 hair samples (> 2 g) were collected using electric clippers from the same location on ewes and lambs and stored at room temperature until analyzed for cortisol concentrations by ELISA. Data was analyzed using SAS (9.3) with weaning treatment and day as the main effect. Plasma cortisol of ewes was not different (P > 0.10) between treatments but decreased between d 2 and 3 in FL (P < 0.03) and NFL ewes (P < 0.04). On d 28 FL ewes had greater (P < 0.05) cortisol concentrations than NFL ewes. Ewe hair cortisol was not different between treatments or day (P > 0.10). Plasma cortisol of lambs was not different (P > 0.10) between treatments but increased between d 2 and 3 in FL lambs (P < 0.04) and d 1 and 3 in NFL lambs (P < 0.02). Lamb hair cortisol increased between d 1 and 28 in all lambs (P < 0.002). Hair cortisol was not correlated with plasma cortisol in ewes or lambs (P > 0.10). Ewe plasma cortisol concentration decreased as lamb plasma cortisol increased during the weaning process, regardless of proximity to the ewe, indicating that the lambs may be experiencing more stress at weaning than the ewes.

Keywords: Sheep, Weaning, Stress

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072 A probiotic bolus is ineffective in reducing Salmonella shedding in orally-inoculated weaned pigs.

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Salmonella shedding proximal to harvest is a significant issue for the swine and meat industries. Probiotic supplementation prior to transport, lairage, and harvest has been suggested as a possible intervention to reduce *Salmonella* carcass contamination. In this study, a bolus dose of probiotic prior to *Salmonella* infection was examined as a possible intervention strategy. Weaned pigs (n = 40; 6.1 ± 2 kg) were individually housed in an environmentally-controlled facility and separated into two treatments 1) fed no probiotic (CON) or 2) fed the CON diet + 20 g of a lactobacillus-based probiotic supplement (PRO) on d -9, -8, -3, -2 relative to oral inoculation on d 0 with 4.7 x 10^9 CFU of *Salmonella* Typhimurium . All animals were confirmed by fecal culture to be negative for *Salmonella* prior to challenge. Fecal samples were collected daily from d -1 to 3 relative to the challenge. At 72 h post-inoculation, the pigs were humanely euthanized and tissues were collected to determine the presence and quantity of the inoculated *Salmonella*. Tissues collected included: mesenteric lymph node (LN), subiliac LN, cecum, liver, spleen, kidney, and gallbladder. There were no treatment differences (P>0.05) in fecal shedding quantities of *Salmonella* for 3 d post-challenge. There was also no difference between treatments in the concentration of *Salmonella* in the mesenteric LN (P=0.32). There was a tendency for increased *Salmonella* concentrations in PRO cecum in comparison to CON (P=0.08; 4.4 vs. 5.2 log CFU/g, respectively) and liver tissue (P=0.06; 0.37 vs. 1.09 log CFU/g, respectively). Increased concentrations of *Salmonella* were isolated from PRO pigs in the spleen compared to CON (P=0.02; 0.48 vs. 1.56 log CFU/g, respectively) and gallbladder (P=0.01; 0.21 vs. 1.13 log CFU/g, respectively). Interestingly, more *Salmonella* was isolated from PRO subiliac LN when compared to CON pigs (P=0.036; 0.47 vs 1.57 log CFU/g, respectively). While there was no difference in fecal shedding between treatments, PRO pigs harbored more *Salmonella* in their internal organs, and more translocation into musculoskeletal lymph occurred in the PRO pigs. Overall, this suggests that the timing and dose of this probiotic was not only ineffective, but was detrimental to the pigs under a *Salmonella* challenge. Research should be conducted to determine a more optimal supplementation strategy to mitigate the effects of a live pathogen challenge.

Keywords: pig, probiotic, *Salmonella*

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073 Effect of timing of local anesthesia on physiological responses in calves after dehorning.

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Dehorning is a painful animal management procedure that is commonly performed in dairy calves. The combination of non-steroidal anti-inflammatory drugs (NSAID) and local anesthesia lessens the physiological and behavioral effects of dehorning in calves. Twenty-four intact male Holstein calves (11 to 16 wks of age) were assigned to one of three treatments (n = 8 calves/treatment) to evaluate effects of timing of local anesthesia on physiological indicators of stress associated with pain of dehorning. Treatments included: 1) anesthesia without dehorning (control; C); 2) anesthesia followed by immediate dehorning (INS); and 3) anesthesia with a 10 minute delay prior to dehorning (WAIT). Six hours prior to dehorning, jugular catheters (14 gauge, 3.5 inch; MILA International, Inc.; Erlanger, KY) were inserted. Blood samples were collected ten minutes prior to and immediately prior to (0 minute sample) the initiation of the experiment. At the start of the procedure, all calves were given meloxicam (1mg/kg BW) in an oral bolus immediately prior to the administration of anesthesia. A cornual nerve block was performed with 5 ml of 2% lidocaine hydrochloride on both horns. Blood samples were collected at 10 min intervals after administration of the nerve block for one hour. Blood samples were collected again at 1.5, 2, 4, 6, 8, 12 and 24 hours after the procedure. Plasma was harvested and stored frozen for analysis of cortisol and Substance P by radioimmunoassay. Cortisol concentrations were lower ($P < 0.05$) in C than INS and WAIT at 30, 40, 50, and 60 min after anesthesia. Cortisol levels did not differ ($P > 0.05$) between INS and WAIT at any time point. Substance P concentrations did not differ ($P > 0.05$) across treatments at any time point. These data indicate that waiting 10 minutes after administration of local anesthesia provided no improvement over immediately dehorning after anesthesia in reducing stress associated with this procedure.

Keywords: dehorning, anesthesia, meloxicam

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074 Cytochrome P450 Polymorphisms Influence Growth and Immune Function of Dairy Heifers Grazing Stockpiled Endophyte-Infected Tall Fescue.

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Bovine cytochrome p450 (CYP) is an enzyme that can metabolize ergot alkaloids which are associated with fescue toxicosis. The coding sequence SNP (C994G) in CYP3A28 has been associated with cattle productivity. Our objectives were to determine the relationships between CYP3A28 genotypes of crossbred (Holstein × Jersey) dairy heifers (n = 31) and productivity traits while grazing stockpiled tall fescue pastures (n = 8; 1.62 ha each). Heifers were stratified by weight and randomly allotted to two cultivars of tall fescue (*Lolium arundinaceum* [Schreb.] S. J. Darbyshire): Kentucky 31 (KY31; wild-type endophyte-infected; 4 pastures), and HiMag 4 (HiMag; non-toxic endophyte-infected; 4 pastures). Dependent variables were growth traits (body weights and average daily gain), and immune function as assessed by blood cell profiles. Blood and animal weights were collected on days 0, 28, 56, and 84. Genomic DNA was purified from buffy coat samples and genotyped at C994G. Genotypes (CC, CG and GG) were determined by using the Sequenom technology (GeneSeek, Lincoln, NE). Data were analyzed using mixed model ANOVA with pasture as experimental unit, heifer weights and blood cell distributions as repeated measures, and pasture within cultivar as a random effect. Heifers homozygous for the minor allele (GG) and grazing KY31 had the slowest ($P < 0.01$) ADG (0.43 ± 0.07 kg/d) throughout the 84-d trial when compared with other heifer groups (ADG range of 0.82 to 1.02 kg/d); consequently, GG heifers grazing KY31 also had the lowest $P < 0.01$) body weights (219 ± 9.2 kg vs. 242 - 269 kg in other heifer groups). Most of the blood characteristics were not affected ($P > 0.10$) by C994G genotype; however, heifers grazing KY31 had a higher ($P < 0.05$) concentration of hemoglobin (13.4 ± 0.40 g/dL vs. 11.3 - 12.5 g/dL) and hematocrit (38.2 ± 1.42% vs. 31.3 - 35.7%; $P < 0.01$). Results of this study indicate that management tools such as stockpiled tall fescue and CYP genotyping may be used to develop more productive dairy heifers.

Keywords: Holstein, immune function, tall fescue

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075 Development of an equine non-contact thermography device: Relationship of ocular and rectal temperatures to indicators of health status in horses.

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Rectal temperature is commonly used in the horse industry to distinguish between febrile and non-febrile animals, although this method of temperature collection is accompanied by efficiency and safety limitations. Newer technologies such as infrared thermal imaging cameras are being developed and tested as possible alternatives to rectal temperatures. The objectives of this study were to compare a prototype non-contact thermography device (NCT) to a traditional FLIR® thermal imager (FLIR Systems Inc., Wilsonville, OR) and to determine the relationship between rectal and ocular temperatures as indicators of health status. To accomplish this, 91 measurements were taken on sedentary horses (2-15 yr; 357 to 540 kg) at a distance of 1 m with the FLIR® and NCT at the: medial canthus (MC), ocular globe (OG), and lateral canthus (LC) of the eye. Rectal temperatures were obtained for a standardized body temperature. Relationships between measurements were analyzed using the PROC CORR procedure of SAS. A moderate relationship was observed between the NCT:FLIR® at the OG ($r = 0.51$; $P \leq 0.05$) and the LC ($r = 0.54$; $P \leq 0.05$); however, only a weak relationship was detected at the MC ($r = 0.08$; $P \leq 0.05$). When compared to rectal temperatures, the FLIR®:Rectal relationship was stronger at the MC ($r = 0.42$; $P \leq 0.05$) and LC ($r = 0.33$; $P \leq 0.05$) than the NCT:Rectal relationship ($r=0.02$ and $r = 0.28$ respectively; $P \leq 0.05$). Conversely, the NCT:Rectal correlation was stronger at the OG ($r=0.41$; $P \leq 0.05$) than the FLIR®:Rectal relationship ($r = 0.31$; $P \leq 0.05$). The results of this study indicate that the two thermography devices function similarly to one another, but their utility for accurately determining body temperature remains limited. However, both technologies may prove useful as an efficient preliminary screening device of potentially ill horses.

Keywords: Infrared, Thermography, horse, health, body, temperature, fever

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076 Modulation of the acute phase response following a lipopolysaccharide challenge in pigs supplemented with an all-natural Saccharamyces cerevisiae fermentation product.

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This study was designed to determine if feeding a *Saccharamyces cerevisiae* fermentation product to weaned pigs would reduce the stress and acute phase responses (APR) following an acute lipopolysaccharide (LPS) challenge. Pigs (n = 20; 6.4 ± 0.2 kg BW) were obtained and transported to an environmentally-controlled nursery facility. Pigs were housed individually in pens with *ad libitum* access to feed and water. Pigs were weighed upon arrival and assigned to 1 of 2 treatment groups (n = 10 pigs/treatment): 1) non-medicated starter diet (Control); 2) Control + *Saccharomyces cerevisiae* fermentation product fed at 2 kg/MT (XPC; Diamond V Original XPC™, Cedar Rapids, IA). All pigs remained on their diets for 18 d. Pigs were anesthetized on d 7 and 14 for insertion of an intraperitoneal (IP) temperature recording devices and jugular catheters, respectively. On d 15, pigs were challenged i.v. with LPS (25 µg/kg BW). Blood samples were collected at 0.5 h (serum) and 1 h (complete blood cell counts) intervals from -2 to 8 h and at 24 h relative to LPS administration at 0 h. Pigs were weighed on d 7, 14, and 18, while feeders were weighed on d 7, 11, 14, 17, and 18. There was no effect of treatment ($P \leq 0.69$) for BW, ADG, or feed disappearance, although an increase over time was observed ($P < 0.01$). Control pigs had greater ($P \leq 0.03$) white blood cell (15.4 vs. 11.9 ± 0.5 10^3 cells/µL), neutrophil (7.1 vs. 4.6 ± 0.3 10^3 cells/µL), and lymphocyte (7.4 vs. 6.6 ± 0.2 10^3 cells/µL) counts compared to XPC-supplemented pigs. Serum cortisol increased ($P < 0.01$) after LPS administration but was not affected by treatment ($P = 0.92$). There was a treatment effect ($P \leq 0.002$) for serum TNF-α and IL-6 such that concentrations were greater in XPC-supplemented pigs than Control pigs (116.5 ± 5.0 vs 90.9 ± 5.2 pgs/mL TNF-α; 188.3 ± 13.4 vs. 133.4 ± 11.7 pg/mL IL-6) following LPS challenge. Administration of LPS increased IP temperature ($P < 0.01$) in all pigs, however, there was no effect of treatment ($P = 0.12$). These data demonstrate that feeding an all-natural *Saccharamyces cerevisiae* fermentation product to newly-weaned pigs can modulate the APR to an LPS challenge without affecting performance.

Keywords: acute phase response, lipopolysaccharide, *Saccharomyces cerevisiae* fermentation product

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077 Hair Coat Phenotype in Heifers Alters Physiological Responsiveness to Ergot Alkaloids Commonly Found in Endophyte-Infected Tall Fescue.

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Fescue toxicosis impacts cattle consuming endophyte-infected tall fescue (*Festuca arundinacea*) resulting in substantial economic losses annually to the beef industry. Symptoms of this disease include increased respiration and body temperature, retained winter hair coat and vasoconstriction. Originally identified in Senepol cattle, the slick gene creates for short, slick hair and cattle that more effectively regulates body temperature. Therefore, the objective of this study was to determine if cattle expressing the slick gene have increased tolerance to physiological symptoms associated with ergot alkaloids from endophyte-infected tall fescue. Angus X Senepol heifers (n=31) were blocked by weight and hair type, (Slick; S or Normal; N) and placed in Calan gates then randomly assigned to receive either endophyte-infected fescue haylage (E+) or non-infected fescue haylage (E-; control) for 63d. Weekly measurements were collected to monitor physiological responses during exposure to ergot alkaloids. Data were analyzed using repeated measure in the PROC MIXED procedure of SAS. Average daily gain was decreased in E+N heifers (0.48 kg/d) compared to other heifer groups ($P<0.05$; 0.63, 0.62, 0.58 kg/d for E+S, E-N, and E-S, respectively). Body condition scores were greater for E-S, E+N and E+S (5.6, 5.6 and 5.7, respectively) compared to E+N (5.5; $P<0.05$). Hematocrit values were lower ($P<0.05$) for the E+ heifers compared to E- heifers, however no differences were observed in hair type. No differences were observed in caudal vessels between treatment groups ($P>0.05$); however blood pressure decreased in E+ heifers compared to E- heifers ($P<0.05$; 136/77 vs. 145/86 mmHg for E+, and E-, respectively). Respiratory rate, heart rate and rectal temperatures were similar ($P>0.05$) across all groups. Although no difference was observed in rectal temperature during weekly collection days, daily fluctuations in body temperature varied among treatment groups. As expected, skin surface temperature was increased E+N heifers (38.1°C) compared to other heifer groups ($P<0.05$; 37.1, 37.2 and 36.8 °C for E+S, E-N, and E-S, respectively). Hair coat scores (1-5 scale) were significantly lower for E-S and E+S (1.7 and 2.2, respectively) compared to E-N and E+N (2.9 and 3.1, respectively; $P<0.05$). Additionally, shedding scores were lower for E-S and E+S (1.5 and 2.2, respectively) compared to E-N and E+N (2.5 and 2.6, respectively; $P<0.05$). Based on these data, incorporating the slick hair phenotype in to cattle may be advantageous to help offset some of the negative effects associated with fescue toxicosis.

Keywords: fescue toxicity, slick gene, beef heifers

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RUMINANT ANIMAL PRODUCTION I

078 Impact of breed and forage type on intake, performance, and residual feed intake of beef calves during the backgrounding period.

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Forage quality, and possibly forage harvesting method, can impact calf performance during the backgrounding period. In addition, breed type may impact calf performance based on harvest method. Thirty Angus (n = 16, BW = 255.8 ± 9.7 kg) and Brangus (n = 14, BW = 231.8 ± 38.5 kg) ranch-of-origin steers from two locations were used to determine the effects of feeding annual ryegrass (*Lolium multiflorum*) hay or baleage on DMI, residual feed intake (RFI), and performance. Steers were stratified by initial BW and breed and fed a diet consisting of either hay (DM = 89.7%, CP = 12.4%, NDF = 69.4%, TDN = 56.9%) or baleage (DM = 51.2%, CP = 11.9%, NDF = 68.3%, TDN = 56.2%) in a 2 × 2 factorial arrangement. At weaning, steers were housed in individual pens (2.2 x 9.1 m) equipped with 2.2 m of linear bunk space for a 14 d adaption and 64 d feeding period. Individual feed intake was collected daily and used to calculate RFI for each steer as the difference between actual and expected feed intake calculated based on metabolic BW and ADG. Steer was the experimental unit. Two-day initial, weekly, and final BW were collected to determine BW gain and ADG. Data were analyzed using Proc GLM with breed and diet as fixed effects and initial BW as a covariate. There was no breed × diet interaction ($P \geq 0.40$); therefore, all data were pooled for main effects. End BW, BW gain, and ADG tended to be greater ($P = 0.05$) for Angus compared with Brangus calves, respectively. In addition, DMI and RFI was lesser ($P < 0.01$) for Brangus (4.43 and -0.30 ± 0.09 kg, respectively) compared to Angus (5.32 and 0.26 ± 0.09 kg, respectively) calves. For diet effect, final BW, BW gain, and ADG was greater ($P < 0.01$) for calves consuming baleage compared to hay. Dry matter intake was also greater ($P < 0.01$) in calves consuming baleage (5.37 ± 0.09 kg) compared with hay (4.40 ± 0.09 kg) and RFI tended to be greater ($P = 0.06$) for calves consuming baleage (0.10 ± 0.08 kg) compared with hay (-0.14 ± 0.08 kg), respectively. Brangus calves consumed less forage, yielding lower gains in addition to a lower RFI. Feeding baleage of similar quality during the backgrounding period resulted in greater intake and animal performance.

Keywords: backgrounding, intake, residual feed intake

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079 Timing of growth implant insertion affects growth and humoral immune response of preconditioning beef steers.

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This study evaluated the effects of timing of growth implant insertion on growth and humoral immunity of beef steers. At 14 d before weaning (d -14), Angus steers (n = 48; 217 ± 5 kg of BW; 191 ± 3 d of age) were stratified by BW, age and cow parity, and randomly assigned to receive no implant (**NoIP**) or 36 mg of Zeranol (Ralgro; Merck Animal Health) on d -14, 0 or 14, relative to weaning (**IP-14**, **IP0** and **IP14**; 12 steers/treatment). Steers remained on a single tall fescue pasture from d -14 to 0, and then weaned on d 0, stratified by treatment and BW, and allocated to 1 of 16 feedlot pens (3 steers/pen) to receive free-choice access to a 71% corn silage:29% concentrate diet (66% TDN, 12% CP; DM basis) for 56 d. Steers received 2 mL subcutaneous of Bovi Shield Gold FP5VL5 and Ultrabac 7 (Zoetis Animal Health) on d -41 and 0. From d -14 to 56, steers were weighed before feeding on 2 consecutive d every 14 d, whereas blood samples from jugular vein were collected every 7 d to determine plasma IGF-1 concentrations and serum titers against infectious rhinotracheitis (IBR), bovine viral diarrhea virus (BVDV) type 1-b and 2. Daily DMI, ADG and G:F from d 0 to 56 did not differ among treatments ($P \geq 0.14$). However, overall ADG from d -14 to 56 was greater for IP-14 vs. NoIP ($P \leq 0.04$), and intermediate for IP0 and IP14 steers (1.38, 1.20, 1.33 and 1.24 ± 0.05 kg/d, respectively), whereas overall plasma IGF-1 concentrations were greater for IP-14 vs. NoIP, IP0 and IP14 steers ($P = 0.05$). Consequently, mean BW from d -14 to 56 was greater for IP-14 vs. NoIP and IP14 ($P \leq 0.01$), and intermediate for IP0 steers ($P \geq 0.18$; 271, 267, 263 and 262 ± 2.1 kg, respectively). Serum BVDV-1b and -2 titers did not differ among treatments ($P \geq 0.27$), but serum IBR titers on d 42 were greater for IP14 vs. NoIP, IP0 and IP-14 steers ($P \leq 0.01$; 1.23, 0.13, 0.30 and 0.43 ± 0.228 $\log_2$, respectively). Hence, timing of zeranol-based implant insertion relative to weaning had variable effects on vaccine-induced humoral immune response, but enhanced growth performance of preconditioning beef steers if administered 14 d pre-weaning.

Keywords: Humoral immune, implant, preconditioning, steers, vaccine

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080 Long-term effects of Pongamia seedcake as a protein supplement in cattle consuming forage.

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Fifteen steers (253 ± 64 kg initial BW) were used in a randomized complete block for 126 d to determine the long-term effects of feeding expeller pressed (EKC) or solvent extracted (SKC) Pongamia seedcake (PSC). Treatments consisted of a control (commercially available protein supplement containing 0% PSC), a supplement containing 20% expeller-processed PSC (EKC), or a supplement containing 20% solvent-processed PSC (SKC). Supplements were formulated to contain 30% CP. One kg of supplement was offered, and bermudagrass hay (7.0% CP, 73.8% NDF) was offered ad libitum. Intake of forage and supplement was recorded daily. Steers were weighed at wk 0, 9, and 18. Diet digestibility was evaluated using ADIA as an internal marker at wk 13. Steers receiving 0% Pongamia consumed 1.00 kg/d of supplement, those receiving 20% SKC consumed 1.00 kg/d of supplement, and those receiving 20% EKC consumed 0.67 kg/d of supplement. Steers fed control supplement had significantly greater ($P <$ 0.05) total OM intake (90.1 g per kg $BW^{0.75}$) than steers receiving the 20SKC supplement (74.8 g per kg $BW^{0.75}$). Intake for steers fed 20EKC was intermediate (81.3 g per kg $BW^{0.75}$) and did not differ ($P > 0.05$) from the other treatments. Total tract digestion was not different between treatments ($P = 0.29$) and averaged 60.3%. Final BW of steers fed the control supplement (330 kg) was greater ($P < 0.05$) than those fed either EKC or SKC (296 and 302 kg, respectively). Total gain was greater ($P < 0.05$) for control-fed steers (75.1 kg) than for steers fed PSC treatments, with no difference ($P = 0.72$) between PSC treatments (49.6 and 48.1 kg for EKC and SKC, respectively). Daily gain for steers fed the control supplement (0.60 kg/d) was greater ($P < 0.05$) than those receiving PSC supplements (0.39 and 0.38 kg/d for 20% EKC and 20% SKC fed steers, respectively). No deleterious effects were observed, but reduced BW gain was observed for steers fed PSC supplements.

Keywords: Pongamia seedcake, protein supplementation, long-term feeding

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081 Feedlot performance of crossbred calves vaccinated with Salmonella Newport Extract vaccine.

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Feedlot performance and carcass characteristics of crossbred beef calves vaccinated at weaning with a commercially available *Salmonella* Newport Extract vaccine were studied. Exit velocity (m/sec) and pen score (1 = calm and 5 = excitable) data collected from calves 28 d before weaning were used for assignment to 1 of 3 temperament classes (calm, n=17; intermediate, n=26; temperamental, n=15). Calves, stratified by temperament class and sex (bull and steer), were assigned to non-vaccinated (control, n=29) and vaccinated (n=29) groups. Vaccinated calves received 2 ml of *Salmonella* Newport Extract vaccine (Zoetis, Florham Park, NJ) twice: at weaning (d 0) and 28 d after weaning. Calves were weaned and back grounded for 56 d and then allowed to graze ryegrass pastures for 90 d. Steers and bull calves were then shipped to the Tri-County Steer Carcass Futurity in Iowa and fed until harvested at a common fat cover endpoint and carcass data collected. Bulls were castrated on arrival at feedlot, creating early (EC; n=29) and late-castrated (LC; n=29) groups. Weights were recorded at the feedlot upon arrival, on-test, mid-point and final weight. Weight and carcass data were analyzed with mixed model procedures of SAS; sex (castration date), temperament class, and vaccination group were included as fixed effects. There were no treatment interactions. Castration date tended to influence (P<0.09) BW and HCW. Castration date, temperament and vaccination group did not affect overall ADG (EC 1.47 ± 0.01 vs LC 1.37 ± 0.06 kg) or carcass characteristics (Ribeye area, KPH, dressing %, USDA Yield Grade, P>0.10). Total feed intake, feed cost, and income was greater in EC (P<0.05); however, individual medical treatment cost and number of treatments was greater in LC (P<0.04). However, overall profit (P>0.05) was not influenced by castration date, temperament or vaccination group. All early castrated steers and 93% of late castrated steers graded Low Choice or better. Number and cost of medical treatments were negatively (P<0.02) correlated with profit and HCW. Temperament and vaccination group did not *(P*>.0.10) influence profit, HCW, yield grade, medical treatment cost or feed cost. Immunization with a commercially available *Salmonella* Newport Extract vaccine of crossbred beef calves did not have any

negative influence on subsequent feedlot performance or carcass characteristics.

Keywords: Temperament, Beef cattle, *Salmonella* Newport Extract vaccine, Feedlot performance

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082 Methane and VFA Production Rates by in vitro Mixed Ruminal Microorganism Fermentations of Purified Carbohydrates and a Variety of N Sources.

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An in vitro study was conducted to determine VFA and CH_4 production from purified carbohydrate substrates and nitrogen sources in a randomized complete block design with a 3×4×4 factorial treatment arrangement. Combinations of 4 carbohydrate sources (cellulose (CEL), glucose (GLC), starch (STA) or no substrate (NEG) and 4 N sources, (nitrogen free (NF), ammonia (NH3), casamino acids (CAS), or an equimolar mixture of NH3 and CAS (MIX)) were incubated for 4-, 12-, and 24-h. Carbohydrates were added at 1600 mg/L and N sources were added 900 mg/L. Samples were evaluated for VFA and CH_4 concentrations. Model effects included hour, N source and carbohydrate and all 2- and 3-way interactions. Means within h were separated using Tukey's HSD. A N×h interaction (P<0.01) was observed for CH_4. There were no differences in CH_4 concentrations among N sources at 4-h (mean = 0.9m*M*). At 12-h NF, NH3, and MIX (3.4, 2.9, and 3.1m*M*) had lower CH_4 concentrations compared to CAS (4.1m*M*). By 24-h there were no longer differences in CH_4 (mean = 4.0m*M*). A carbohydrate×h interaction (P<0.01) for CH_4 was observed; at 4-h GLU contained more CH_4 (1.8m*M*) compared to STA, CEL, and NEG (0.84, 0.46 and 0.45m*M*, respectively). At 12-h STA contained the most CH_4 (5.6m*M*), GLU and CEL contained similar amounts of CH_4 (3.4 and 3.2m*M*), and NEG the lowest CH_4 (1. 3m*M*). At 24-h, the same pattern was observed for CH_4 concentrations for STA, CEL, GLU, and NEG, (6.8, 5.6, 5.0, and 1.5m*M*). A N×h interaction for VFA concentration (P <0.01) was driven by similar responses among N sources at 4-h, CAS and MIX having greater concentrations (56 and 54 m*M*) than NF or NH3 (45 and 44m*M*) at 12-h, and by 24-h CAS, MIX, and NF having similar VFA concentrations (63, 61 and 58m*M*), while NH3 (52m*M*) had lower CH_4 than CAS and MIX. There was also a carbohydrate×h interaction for VFA (P<0.01). At 4-h GLU (44m*M*) was greater than CEL and NEG (37 and 36m*M*) and STA was intermediate (38m*M*). By 12-h GLU and STA VFA concentrations (59 and 57m*M*) were greater than CEL and NEG (44 and 40m*M*). At 24-h GLU and STA were both 70m*M* while VFA concentrations were 54 and 40m*M* for CEL and NEG, respectively. Carbohydrate and N sources independently affect VFA and CH_4 production, and these results may lead to more refined predictive models of CH_4 production.

Keywords: Methane, fermentation, in vitro

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083 Effect of breed type and backgrounding diet on stocker performance and carcass characteristics.

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Grass-fed beef (GFB) production requires maximizing the use of forage-based diets. Differences in breed types might be a factor to consider for year-round production. Breed type and diet during the backgrounding period might influence performance of beef calves during the subsequent winter grazing period. Twenty-four Brangus (BN; n=12) and Angus (AN; n=12) steers (BW=263 ± 35 kg) were blocked by breed and diet fed (annual ryegrass [*Lolium multiflorum*] hay {HAY} or baleage {BAL}) during a 78-d backgrounding period in a split-plot design with three replicates (8 steers/replicate). All steers had access to ryegrass hay for 2 wk from arrival to start of the grazing period. Steers were weighed with no restriction of feed and water on 2 consecutive days and allotted to three pastures of no-tilled annual ryegrass (var. 'Marshall') and berseem clover (*Trifolium alexandrium*; var. 'Bigbee') and rotationally stocked (1.5 steers/ha) for 112 d. Data were analyzed using Proc Mixed with breed and backgrounding diet as main- and sub-plot, respectively. Initial BW was used as covariate for performance data. Twelve steers (4/replicate, 2 of each breed, 1 of each diet within breed) were harvested at the end of the grazing period, carcass data collected and these analyzed using hot carcass weight as covariate. There were no effects (P > 0.05) of breed types or backgrounding diet on stocker performance and final BW. Total ADG were 1.35 and 1.36 kg for AN and BN, respectively. Steers that consumed ryegrass hay during the backgrounding period gained 1.37 kg/d while those that consumed baleage gained 1.33 kg/d. Final BW were 424.1, 425.2, 422.5, and 426.9 kg for AN, BN, BAL, and HAY, respectively. Only ribeye area was different (P = 0.02) between AN (54.2 cm^2) and BN (48.7 cm^2), with no effect (P > 0.05) of backgrounding diet. Based on these data, no differences in stocker performance should be expected between AN and BN or due to the use of hay or baleage during the backgrounding period; however, breed type may affect certain carcass characteristics. The evaluation of forage-based diets and breed types to improve performance and carcass characteristics is of major importance for year-round GFB production.

Keywords: beef carcass, berseem clover, breed types, grass-fed beef, ryegrass

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084 Effects of monensin and dietary energy intake on maintenance requirements in beef cows.

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Decreases in land availability and cow inventory has created a concern for the sustainability of beef cattle production. Intensifying production by feeding cows in a controlled environment (i.e. drylot) that allows for dietary manipulation could improve system efficiency. Forty crossbred (*Bos taurus*, *Bos indicus*; BW 385 ± 25 kg), three-year-old cows in mid-gestation were used in a 56-d experiment designed to examine the effects of monensin inclusion and dietary energy intake on energy metabolism. A total mixed ration (1.54 Mcal NE/kg) was used to apply treatments in a 2´2 factorial arrangement. Two levels of NE intake (80%, **L**; and 120%, **H** predicted NRC requirements) were fed either without (**0**) or with (**200**) monensin (mg·hd^{-1}·d^{-1}). Ultrasound measurements were taken on d 0 and 56 to calculate total body energy. Samples of feces and BW were collected every 14 d. Digestibility of DM, OM and GE were greater in L than H ($P < 0.01$), but were not affected by monensin ($P > 0.18$). There was a monensin × time ($P = 0.03$) and intake × time ($P < 0.01$) interaction for changes in BW as 200 fed cows on L treatment had delayed BW loss compared to 0 fed cows, suggesting monensin increased energetic availability of the diet. Cows gained more BW when fed H (18 kg) versus L (-4.6 kg; $P < 0.01$) with no effect of monensin ($P = 0.97$). Retained energy (kcal·EBW$^{-0.75}$·d^{-1}; $P < 0.01$) and heat production ($P < 0.01$) were both greater for H than L. Monensin had no effect on RE ($P = 0.94$) or HE ($P = 0.53$). Using mean MEI and RE data, estimated ME_m values were calculated by regressing RE on MEI and solving for RE=0. Fasting heat production was calculated by regressing the log (HE) on MEI. Monensin did not alter ME_m or FHP. However, average FHP across all treatments was estimated to be 62.85 kcal·EBW$^{-0.75}$·d^{-1}, a decrease of 26.1% from NRC estimates. This indicates energy requirements are reduced when limit-fed, and the NRC overestimates maintenance requirements for limit-fed gestating cows. Through nutritional manipulation, it appears that gains in production efficiency can be made through intensifying beef cattle production. Further research is needed to understand how monensin affects limit-fed gestating cows over longer periods of time.

Keywords: monensin, limit-fed, maintenance requirements

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085 Impact of breed and forage conservation method on apparent total tract nutrient digestibility in beef calves during the backgrounding period.

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Thirty Angus (n = 16, BW = 255.8 ± 9.7 kg) and Brangus (n = 14, BW = 231.8 ± 38.5 kg) steers were used to determine the effects of forage conservation method, breed, and potential interaction on apparent total tract digestibility of nutrients during the backgrounding period. Steers were stratified by initial BW and breed and fed ad libitum amounts of annual ryegrass (*Lolium multiflorum*) conserved as either hay (DM = 89.7%, CP = 12.4%, NDF = 69.4%, TDN = 56.9%; HAY) or baleage (DM = 51.2%, CP = 11.9%, NDF = 68.3%, TDN = 56.2%; BAL) in a 2×2 factorial arrangement with feed and breed as main effects. Diets were fed for 14 d before the digestibility measurements and steers were divided in two groups staggered by one wk to facilitate sample collections. Steers were housed in individual pens (2.2×9.1 m) equipped with 2.2 m of linear bunk space, and individual feed intake was collected. Feed and fecal samples were collected twice daily for 4 d and composited within steer to analyze for DM, OM, CP, NDF, and ADF. Indigestible NDF was used as an internal digestibility marker. Steer was the experimental unit and data were analyzed using the MIXED procedure of SAS with breed and feed as fixed effects and sampling group as a random effect. No breed × feed interactions were observed for any of the variables analyzed. A breed effect ($P < 0.01$) was observed for all nutrient intake variables during the 4-d sample collection period; however, no breed effect was observed for any of the digestibility variables. Angus and Brangus steers had DMI of 5.0 ± 0.11 kg/d and 3.9 ± 0.12 kg/d, respectively during the collection period. A feed effect was observed ($P< 0.01$) for DM, OM, NDF, and ADF apparent total tract digestibility, where BAL had greater digestibility than HAY. Nutrient digestibility main effect means were: 67.9 vs. 57.1 ± 0.67%, 69.1 vs. 57.8 ± 0.62%, 74.9 vs. 61.9 ± 0.68%, and 74.9 vs. 58.6 ± 0.76% for DM, OM, NDF, and ADF in BAL vs. HAY, respectively. In conclusion, Angus or Brangus steers consuming annual ryegrass either as hay or baleage had similar apparent total digestibility of nutrients. When ryegrass was conserved as baleage rather than hay, apparent total tract digestibility of DM, OM, NDF, and ADF was increased in backgrounding beef steers.

Keywords: beef steers, breed, digestibility

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086 Effects of monensin and dietary energy intake on diet utilization, VFA profile and ruminal fill in beef steers.

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Digestibility is known to be increased in limit-fed cattle, while ionophores are known to alter ruminal fermentation. However, there is limited literature on combining these feeding techniques. Sixteen ruminally cannulated Angus×Hereford steers (BW 288 ± 20 kg) were used in an experiment designed to examine the effects of ionophore inclusion and intake on digestibility, ruminal pH, VFA concentrations and ruminal fill. A total mixed ration (TMR; 1.54 Mcal NE/kg) was used to apply treatments in a 2´2 factorial arrangement. Two levels of NE intake (80%, **L**; and 120%, **H** predicted NRC requirements) were fed either without (**0**) or with (**200**) monensin (mg·hd^{-1}·d^{-1}). Steers were adapted to diets for 14-d, followed by 4-d for measurement of intake and digestion, 1-d for collecting ruminal fermentation parameters, and 1-d to determine ruminal fill. Steers fed L had greater ($P < 0.01$) digestion of DM, OM, ADF and GE than those fed H, while monensin did not affect digestion ($P > 0.15$). Observed values of DE (Mcal/kg DM) were greater ($P < 0.01$) for L (2.90) than H (2.68, but were not affected ($P = 0.74$) by monensin inclusion. Passage rate was slower ($P < 0.01$) for L (1.70% / hr) than H (2.37% / hr) and for 200 (1.90%/hr) compared to 0 (2.16% / hr; $P = 0.03$). Ruminal DM (total kg and %BW) was greater in H ($P < 0.01$) compared to L and for 200 compared to 0 ($P < 0.05$). Mean rumen pH over a 16-h period was greater ($P = 0.01$) for L than H (6.49 vs. 6.33 respectively) and for 200 compared to 0 (6.49 vs. 6.34 respectively; $P = 0.02$). Acetate:propionate was unaffected ($P < 0.01$) by intake level, but was lower ($P < 0.01$) for 200 (2.39) compared to 0 (3.1). Total VFA concentration was lower ($P = 0.03$) for L than H and lower ($P < 0.01$) for 200 than 0. Results suggest that digestibility increases with intake restriction, potentially providing a pathway for increasing dietary energy extrapolation. Data also supports historical literature, indicating that monensin alters ruminal fermentation, such that NE efficiency is increased through end product utilization.

Keywords: monensin, limit-fed, digestibility

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087 Relationship of plasma osmolarity to feed efficiency in beef cattle.

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Dietary cation-anion modification in cattle has effects on productivity through various means, not limited to feed intake. Alterations in dietary cation-anions have been shown to affect plasma osmolarity. Plasma osmolarity is directly related to renal function and metabolism in all animals. In a feeding operation with a single diet fed to a similar population of animals, plasma osmolarity should fall within a normal range (291-339 mOsm), however, both subtle and very distinguishable differences will exist between animals. In theory, variances in osmolarity may reflect differences in metabolism and existing physiological status. In animal production it has become imperative to improve efficiency as feed expenditures are a major component of total costs. Many researchers believe that utilizing residual feed intake (RFI) as a selection tool will lead to improved production efficiency in beef cattle. Residual feed intake is a normally distributed entity that is expressed within a population and like osmolarity will have both subtle and very distinguishable differences existing between animals. The objective of this study is to determine if there are any detectable relationships between plasma osmolarity measurements and RFI within a controlled test population and to further determine how this information may be used in improving the utility of RFI measurements. A previously published study (Shaffer et. al, 2010) where the relationship of RFI to fertility and production measures of beef heifers was reported supplied the plasma samples and production data that was further analyzed. In this study (84d; n=67), intake, BW, and ultrasound measurements of yearling heifers were made. Frozen (-60°C) plasma samples were thawed at room temperature and osmolarity determined. Plasma samples were analyzed to determine osmolarity. All data were analyzed using the CORR procedures of SAS. Plasma osmolarity measured on day 7 and 21 demonstrated a relationship to RFI (r = 0.32; $P = 0.01$ and r = -0.26; $P = 0.03$); no correlations existed ($P > 0.10$) in this data set after day 21. There were little to no relationships between osmolarity and ultrasound rump fat ($P > 0.11$), ribeye area ($P > 0.11$), rib fat ($P > 0.13$) or i.m. fat ($P > 0.10$). There were also no detectable relationships of osmolarity with metabolic body size ($P > 0.28$) or intake ($P > 0.11$). Taken together, these data indicate that plasma osmolarity measurements taken during or shortly after dietary adaptation may have some relationship to the animals' potential RFI value.

Keywords: RFI, osmolarity, feed efficiency

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088 Evaluation of initial body weight and supplementation levels on health and performance of newly received stocker calves.

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Many factors play a role in the health and performance of stocker cattle. The objectives of this study were to evaluate the effects of initial bodyweight, dietary supplementation, and hair coat shedding on growth, performance, and health. Crossbred heifers (n=120) were purchased as either lightweight (136 kg)

or heavyweight (226 kg) calves. Calves within each weight class were randomly assigned to 10 pens each and two levels of dietary treatment (supplementation at 1% of BW or not) were randomly assigned to 10 pens each in a 2x2 factorial design (20 pens, 6 calves per pen). Cattle were weighed on arrival and every 14 day through day 42 of the 45 day trial. Hair shedding scores (HS, LOW= shed, MED=intermediate shed, HIGH=not shed) were taken on day 30. Cattle were examined daily for signs of BRD and supplemented groups were fed once daily. BRD was diagnosed at the first clinical signs and body temperatures greater than 40 ºC. Days-at-risk for BRD was the number of days from arrival until a calf: (1) was first diagnosed with BRD; (2) died; or (3) finished the trial Factors affecting morbidity and growth were tested using Poisson or linear regression (PROC GLIMMIX), respectively, with a correlation structure defining clustering by pen. Overall, 75 calves (62.5%) were treated for BRD over 2,627 days at risk (28.5 /10^3calf-days). Lightweight calves were 2.8 times more likely to be treated for BRD (p=0.02) and each increase in hair shed score increased risk for BRD 1.6 times (p=0.04). Initial BW did not affect gain (P=0.573), but heifers receiving supplementation gained 5.84 kg more than heifers not receiving supplement (P=0.005). Cattle that received LOW HS (n=14) had higher total gain (P=.00016), and ADG (P=.00016) compared to cattle receiving shedding classification of MED to HIGH (n=106). Heifers that traveled 322 to 482 km gained more than heifers that traveled more than 483 km (P = 0.05). Heifers that traveled 8 days from the sale to arrival gained 7.91 kg more than heifers traveling 2 to 4 days (P = 0.01). Health was better for calves with greater initial BW and lower HS. Gain was better for calves receiving supplementation and those with lower HS.

Keywords: BRD, Stocker Cattle
doi: 10.2527/ssasas2015-088

089 Effect of injectable castration regimen administered at branding on gain performance, testosterone production, and testicle atrophy in beef bull calves.

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Castration is performed on bull calves to reduce aggressiveness and sexual activity, facilitate handling, prevent unwanted breeding, and improve meat quality. Currently, no commercially available injectable sterilization methods exist for beef cattle in the US, but has been used in some companion animals. The objective of this study was to evaluate the effect of a zinc solution as an injectable castration method when administered at 3 dosages to beef bull calves at branding on weight gain, testosterone production, and testicle atrophy. Crossbred beef bull calves (n = 31; BW = 114.3 ± 26.3 kg) were allocated to treatments by bodyweight and birthdate. Twenty-seven bull calves were allocated to 3 injectable castration treatments (n = 9 calves/injectable castration treatment) to reflect 3 dosage levels of the zinc solution (Calviex, Cowboy Animal Health, LLC, Plano, TX) with technicians blinded to treatments. On d 0, a single injection of the appropriate dosage of the zinc solution was placed in each testicle. Two bull calves were castrated surgically (negative control) and 2 bull calves were left intact (positive control) until the termination of the study. Calves were weighed on d 0 and on 28-day intervals until they were weaned on d 122. Blood samples were obtained on d 0, 28, 56, 83, and 122 and analyzed for testosterone concentrations. On the same days, scrotal measurements were taken using a digital caliper. There were no effects ($P \geq 0.67$) of Calviex dosage on BW. A main effect of treatment ($P = 0.005$) showed intact bulls had greater ($P < 0.001$, orthogonal contrast of intact vs. castrated) serum testosterone concentrations than bulls castrated with any method. No change in the thicknesses of the scrotum and testes of intact bulls was observed from d 28 to 122; however, the thicknesses of scrotums and testes for calves given all Calviex dosages decreased as the study progressed (treatment × day interaction; $P = 0.0001$). There were no differences ($P \geq 0.39$, linear and quadratic contrasts for Calviex dosage) in thicknesses of scrotums due to the dosage amounts of Calviex solution. At weaning, there were no differences in growth, serum testosterone or scrotal thickness due to the dosage of Calviex used; and the injectable castration method resulted in similar serum testosterone concentrations to calves that had been surgically castrated. Injectable castration can potentially be utilized as an alternative castration procedure to traditional methods.

Keywords: Calviex, injectable castration, zinc solution
doi: 10.2527/ssasas2015-089

RUMINANT ANIMAL PRODUCTION II

090 Effects of Se-fortified Hay Feeding During the Periparturient Period on Measures of Se Status in Cows and Calves.

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The objective of this study was to evaluate the effect of supplemental Se source during the periparturient, on Se status of cows and calves. 27 mature cows were randomly assigned to the follow treatments; no Se (Control; n = 6), Na selenite (n = 9) or High-Se hay (n = 12). Cows assigned to the Na selenite

and High-Se hay treatments were provided 2.5 mg of supplemental Se daily. High-Se hay was created by biofortification of 'Jiggs' bermudagrass (Cynodon dactylon L.) hayfields. Briefly, Na selenate (8.8 g/L) was dissolved into water and sprayed onto hayfields at a rate of 257 g Se/ha at 8 weeks prior of harvest. Selenium concentration of hay harvested from Na selenate-treated fields was greater ($P < 0.001$) than fields without Na selenate treatment (10.8 vs. 0.1 mg Se/kg DM). Cows were moved into partially covered individual feeding areas at an estimated 30 d prior to calving (actual days on treatment = 29.07, 32.60, and 23.83 for high-Se hay, Na selenite, and Control treatments, respectively; SEM = 6.45). Cows calving sooner than 10 d on treatment were removed from the study, which resulted in an unequal number of cows enrolled among treatments. Initial cow Se status was determined by blood and liver samples collected on d 0 (study enrollment). Placenta was collected at calving for determination of Se concentration of cotyledons. Four days after calving, blood and liver samples were collected from both cows and calves for determination of Se status. Initial liver Se concentrations were used as a covariate for analyses. Selenium-supplemented cows had greater ($P < 0.0001$) liver Se concentrations on d 4 after calving compared to Control and cows provided supplemental Se via High-Se hay tended ($P = 0.11$) to have greater liver Se concentrations compared to cows provided Na selenite (0.60, 1.22, and 1.13 mg/kg DM for Control, High-Se hay, and Na selenite, respectively; SEM = 0.057). Similarly, Se-supplemented cows had greater ($P = 0.03$) cotyledon Se concentrations at calving compared to Control, but source of Se did not differ ($P = 0.16$; 0.69, 0.88 and 0.80 mg/kg DM for Control, High-Se hay, and Na selenite, respectively; $P=0.03$; SEM=0.056). Calf liver Se concentrations did not differ ($P \geq 0.58$) among treatments (1.17, 1.27 and 1.21 mg/kg DM for High-Se hay, Na selenite, and Control, respectively). These data imply that Se biofortification of hayfields can increase Se status of periparturient cows.

Keywords: Selenium.

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091 Effects of dietary energy concentration and intake on ruminal pH during various phases of adaptation.

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Highly fermentable diets may cause ruminal acid accumulation leading to subacute ruminal acidosis (SARA), especially upon transition from forage- to concentrate-based diets. Intake restriction reduces acid accumulation, suggesting that intake limits may exist to reduce SARA risk without prolonged adaption. Six ruminally cannulated steers were used in a 6×6 Latin square designed to evaluate effects of energy concentration and intake on ruminal pH during transition, following adaptation, and upon return to a forage diet. Three diets providing 1.580 Mcal NE_m/kg (32% corn), 1.825 Mcal NE_m/kg (48% corn), or 2.070 Mcal NE_m/kg (64% corn) were fed to meet NE requirements (NRC, 2000) for either a 454-kg mature, dry, open cow at maintenance (**LOW**), or a 390-kg primiparous cow at 6.09 kg/d lactation, gaining 0.14 kg/d (**HIGH**) in a 3x2 factorial arrangement. Steers were abruptly switched from hay to treatment diets to initiate each 14-d period. Transition responses were determined on d 1 and 2 (0, 2, 4, 6, 9, and 12 h post feeding); adapted responses on d 10 (0 2, 4, 6, 9, and 12 h after feeding); and hay diet data on d 11-14 (0 and 4 h after feeding) of each period. By 2 h after feeding on d 1, pH was lower ($P < 0.01$) in HIGH (6.47) than LOW (6.69); this effect was sustained through the first 36 h of application ($P < 0.01$). After 10 d of adaptation, mean pH was lower ($P < 0.01$) in HIGH (6.08) than LOW (6.58). Mean pH decreased linearly ($P < 0.01$) with an increase of corn inclusion in HIGH (6.22 to 5.93), and tended to follow the same pattern in LOW ($P = 0.07$; 6.64 to 6.51). Time under pH 5.6 and 6.0 was greater for HIGH ($P < 0.01$), and increased linearly ($P < 0.01$) with corn inclusion in HIGH (115.43–293.62 and 496.55–788.82 min, respectively), but not in LOW ($P > 0.78$). Area (min×pH/d) under pH 5.6 and 6.0 was greater ($P < 0.01$) in HIGH than LOW, and increased linearly ($P < 0.01$) with corn inclusion in HIGH (7.91 – 53.28 and 138.25–265.98 min×pH/d, respectively), but not LOW ($P > 0.78$). One d after returning to forage diets, pH collected 4 h post-feeding ranged from 6.5 to 7.0 across treatments with minimal differences. Results suggest abrupt transition to limit-fed high-energy diets is feasible, and that limiting concentrate intake reduces SARA risk.

Keywords: Limit-fed SARA Adaptation

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092 Polymorphisms in Stress-Related Genes Affect Body Weights of Angus-Based Crossbred Cows at Weaning.

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Stressors elicit a complicated cascade of physiological responses, and the genetic control of those responses is regulated by a host of genes. Our objective was to determine if SNPs in stress-related genes are associated with cow/calf profitability traits. Genomic DNA was extracted from buffy coat samples of Angus-based crossbred cows (n = 131). Genotypes (GeneSeek, Lincoln, NE) for SNP sites in the bovine glucocorticoid receptor (T105G), heat shock protein 70 (G2033C and C895D), and IL-8 (C777G) genes were determined. Three years (2012, 2013, and 2014) of performance data were used to determine relationships with SNP genotypes. Performance traits were Julian calving date, calf weaning weight, cow BW at weaning, cow BCS at weaning, and cow efficiency (calculated by dividing calf wean-

ing weight by cow BW at weaning). Relationships were determined using mixed models ANOVA with genotype and year as the main effects. When F-tests were significant, means were separated using multiple t-tests and Tukey's adjustment. Julian calving date (269 ± 2 d), calf weaning weight (202 ± 4 kg), cow BCS at weaning (5.11 ± 0.07) and cow efficiency (42.25 ± 0.80 %) were not associated ($P > 0.10$) with genotypes for the SNPs tested in this study. However, cow BW at weaning was associated with genotypes. Cows that were homozygous for the primary allele at all SNP sites were approximately 5% heavier (494 ± 4 kg at T105G, G2033C, and C777G; and 495 ± 4 kg at C895D; $P < 0.05$) when compared with cows having the heterozygous alleles (470 ± 9, 471 ± 10, 469 ± 10, and 473 ± 8 kg at T105G, G2033C, C895D, and C777G, respectively). The results of this investigation validate genotyping for stress biomarkers, such as glucocorticoid receptor, HSP70, and IL-8, as a production management tool in cow-calf operations.

Keywords: Angus, SNP, weaning stress

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093 Effect of trace mineral (TM) source on postweaning *Bos Taurus* bull growth, performance and liver mineral status.

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The objective was to investigate the effect of postweaning trace mineral (TM) source on bull growth, performance and liver TM status over a 224 d period. Bulls (231 ± 4 d, 260 ± 5 kg, $n = 14$, 7 per TM) were blocked by sire, age and weaning BW and randomly assigned to TM source (inorganic as salt sulfates, ING; organic as Se-yeast and proteinates, ORG). Diet included cracked corn, cottonseed hulls, a protein pellet, and TM supplement pellet. Weekly BW and blood samples were collected for quantification of serum IGF-1 concentrations by RIA. Hip height (HH) and ultrasound measurements of LM area (LMA), 12th rib back fat thickness (FAT) and LM intramuscular fat percentage (IMF) were recorded every 28 d, while liver biopsies were collected every 56 d to determine TM status (Co, Cu, Fe, Mn, Mo, Se, Zn). Statistical analysis used repeated measures in PROC MIXED of SAS with fixed effects of TM, time and interaction. Growth data presented as LSM ± pooled SE. There was no effect ($P > 0.31$) of TM on LMA (69.18 vs. 70.25 ± 2.11 cm^2), FAT (0.51 vs. 0.48 ± 0.04 cm), IMF (3.41 vs. 3.98 ± 0.39 %), BW (385 vs. 387 ± 17 kg), BCS (5.06 vs. 5.01 ± 0.08) HH (118.7 vs. 118.0 ± 1.4 cm) and ADG (1.25 vs. 1.28 ± 0.09 kg), for ING and ORG, respectively. Throughout the trial, bull LMA, FAT, BW, BCS, HH, ADG and IGF-1 increased ($P < 0.01$), while IMF remained unchanged ($P = 0.56$). Concentrations of IGF-1 did not differ ($P = 0.14$) for ORG compared to ING (182.2 vs. 126.5 ± 25.0 ng/mL, respectively). A TM × time effect ($P < 0.01$) occurred for IGF-1. On d 0, ING (52.7 ± 30.4 ng/mL) and ORG (56.4 ± 30.4 ng/mL) had similar IGF-1, but ORG (198.3 ± 30.6 ng/mL) had greater IGF-1 compared to ING (149.7 ± 29.7 ng/mL) on d 224. Liver TM concentrations were not ($P > 0.11$) affected by TM source, but were affected ($P < 0.01$) by time and increased from trial start in all bulls. Bull performance was not affected by TM source; although, IGF-1 concentrations were increased over time in ORG compared to ING bulls.

Keywords: trace minerals, performance, ultrasound, bull

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094 Comparison of Organic and Inorganic Trace Minerals Supplementation Strategies for Beef Heifers.

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Two hundred and nineteen crossbred heifers were used over a 4-yr period to look at the effects of mineral source on beef heifer reproduction. This was a portion of a 3-yr project that was conducted with the beef cow herd. Within the larger project, cows were assigned to 1 of 4 groups within both spring and fall calving herds, then groups within each herd were assigned randomly to 1 of 2 treatments. Heifers (n = 86) were stratified by body weight and age, and were assigned randomly to groups unless heifers originated as calves (n = 133) from the project; in that case heifers remained on their respective dietary treatment. Treatments were 1) heifers received all supplemental mineral in inorganic forms as Cu, Zn, and Mn in sulfate forms and Co carbonate, or 2) heifers received the same amount of trace minerals but all or a portion of these were from organic forms as Cu, Zn, and Mn amino acid complexes and Co in the form of Co glucoheptonate. Free choice minerals were provided with the appropriate mineral treatments while cattle were maintained on mainly fescue-bermudagrass pastures that were rotated monthly to limit pasture effects. When hay or pastures were not adequate, grain supplements were offered containing the appropriate mineral treatment. Heifers were weighed and body condition scored at the time of palpation to determine pregnancy. There were no differences ($P \geq 0.45$) due to supplementation on BW or body condition score at the time of pregnancy determination. Supplementing heifers with a portion of organic sources of Zn, Cu, and Mn as amino acid complexes and Co as Co glucoheptonate tended to increase ($P = 0.06$) the percentage of heifers that entered the breeding herd (87.5

vs. 70.4%); and tended to improve heifer reproductive performance as evidence by a greater ($P = 0.09$) percentage of heifers calving (76.8 vs. 66%); and a decreased ($P = 0.07$) percentage of heifers culled after their first year in the cow herd (22.1 vs. 33.7%). In the subset of heifers that were conceived and remained on these dietary treatments, there was a decreased ($P = 0.04$) percentage that were culled before their first pregnancy determination (4.8 vs. 15.7%). The addition of organic minerals improved the likelihood they produced a calf.

Keywords: Beef heifers, Nutrition, Trace minerals

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095 Metabolomic profiling for identification of biomarkers associated with temperament in feedlot cattle.

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Objectives of this study were to evaluate the effects of temperament classification on performance and feed efficiency in steers fed a high grain diet, and to examine associations between metabolite profiles and temperament. Performance and DMI was measured for 70 d in Angus cross-bred steers (N = 508) during 3 consecutive years using a GrowSafe system. Exit velocity (EV) measured upon exit from the squeeze chute at the start of trials was used as an objective measure of temperament in this study. Steers were classified into calm, moderate, and excitable temperament groups based on ± 0.5 SD (0.92 m/s) from the mean EV (3.17 m/s). Calm-temperament steers had a higher ($P < 0.05$) ADG (1.72 vs 1.62 ± 0.03 kg/d) and DMI (10.07 vs 9.73 ± 0.12 kg/d) compared to excitable-temperament steers. However, F:G was not affected by temperament classification (6.26 vs 6.48 ± 0.16). Blood samples were collected from 10 calm and 7 excitable-temperament steers in 1 of the 3 trials, and serum metabolite concentrations analyzed using ^{1}H-NMR spectroscopy. Partial least squares (PLS; MetaboAnalyst) was used to examine the associations between metabolites and phenotypic variance in temperament. Of the 44 metabolites detected by ^{1}H-NMR, 6 metabolites had plot scores for variable of importance > 1.5, which included glucose, lactate, allantoin, methionine, alanine, and threonine. The first 2 components of PLS accounted for 34.3% of between-animal variance in temperament. Steers with excitable temperaments had 18, 55, and 17% higher ($P < 0.05$) concentrations of glucose (107.3 vs 88.3 ± 5.43 mg/dl), lactate (39.8 vs 17.9 ± 8.18 mg/dl), and allantoin (2.94 vs 2.44 ± 0.19 mg/dl), respectively, than the calm-temperament steers. In addition, excitable-temperament steers tended ($P < 0.1$) to have higher concentrations of methionine (0.11 vs 0.08 ± 0.01 mg/dl) and alanine (2.33 vs 2.02 ± 0.14 mg/dl) than the calm-temperament steers. Exit velocity was positively correlated with glucose ($r = 0.51$; $P < 0.07$), lactate ($r = 0.62$; $P < 0.02$), and allantoin ($r = 0.56$; $P < 0.04$). These preliminary results based on limited observations reveal that metabolomic profiling may provide opportunities to identify biomarkers that are predictive of temperament in beef cattle.

Keywords: Metabolomics; Temperament

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096 Effects of Rotating Antibiotic and Ionophore Feed Additives on Enteric Methane, Volatile Fatty Acid Production and Rumen Microbial Populations of Steers Consuming a High Forage Diet.

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Ionophore and antibiotic feed additives have been shown to decrease ruminal methanogenesis, but evidence of long-term mitigation is lacking. We proposed a rotation of feed additives as an alternative to reduce methane (CH_4) production. Rumen-cannulated steers (n = 12) were fed a basal high forage diet at 2% of BW (DM) for 13 wk in a Calan gate facility receiving 1 of 6 treatments (trt): 1) control (Con) no additive, 2) bambermycin (B) = 20 mg B/hd/d, 3) monensin (M) = 200 mg M/hd/d, 4) B7M= rotating B and M treatments weekly, 5) B14M = rotating B and M treatments every 14 d, and 6) B21M= rotating B and M treatments every 21 d. Steers were blocked by weight in a RCBD with repeated measures. Rumen fluid was collected weekly for in vitro analysis (n = 13) and results were normalized according to organic matter intake (kg OMI). Trt tended to affect CH_4 to Propionate ratio (CH_4:Pro) ($P = 0.06$) being highest in Con and lowest in M, B21M, and B14M (0.42 vs. 0.36, 0.36, and 0.33, respectively). CH_4:Pro was lower for wks 2 and 3 ($P < 0.05$) than other weeks. Week also affected total VFA peaking at wk 3 and plummeting wk 4 (4.02 vs 2.86 mM/kg OMI; $P < 0.05$). Trt affected gram positive (G^+) bacteria populations being greater for rotationally fed steers than continuously fed steers and Con ($P < 0.01$) and revealing wk 0 was different from wk 5 and 6 but was similar to wk 12 (51.1 vs. 37.5 and 35.1 vs. 44 %, respectively; $P < 0.01$). Interestingly, one class of G^- bacteria (*Sphingobacteriia*), phylum *Bacteroidetes,* was not affected by trt or wk but was positively correlated with CH_4 production ($r = 0.24$, $P = 0.04$) and tended to be a significant covariate to model CH_4 production ($P = 0.09$). *Methanobrevibacter spp.* population tended to correlate with CH_4 production ($r = 0.22$, $P = 0.07$) and was affected by trt where populations in M were greater than B14M (68.9 vs. 51.0 % of Archaea; $P < 0.01$). Wk 0 populations tended to be greater than wk 3 but were not different from wk 12 (60.6 vs. 53.6 vs. 66.3 % of Archaea; $P = 0.09$). Our results suggest microbial adaptation to each trt at some degree. Further investigation of statistical tendencies are merited within phylum of interest.

Keywords: feed additives, CH_4, microbes

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SMALL RUMINANT PRODUCTION I

097 Effect of a Mushroom (Coriolus versicolor) Based Probiotic on the expression of Toll-like receptors in Goat Neutrophils.

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Circulating neutrophils act against invading bacteria by migrating to infected tissue. They are an essential component of goat immunity to mastitis causing pathogens in milk. Pathogen associated molecular patterns are recognized by expression of Toll like receptors (TLR) on the cell surface. Toll-like receptors 1 to 10 have been identified in goat peripheral blood mononuclear cells and other tissues but not in neutrophils. In light of the significant role of the neutrophil in innate immunity to microbial pathogens and the inflammatory response, the objective of this study was to determine expression of TLR by caprine blood neutrophils and to evaluate their modulation by the probiotic (CorPet from the mushroom *Coriolus versicolor* Mycology Research Laboratory, San Francisco, CA). Fifteen (15) female Spanish X Boer goats were drenched daily with 10 mL of either a hot or a cold extract of CorPet and a control group of goats received sterile water for 4 wk. Blood was collected at wk 1 and 4. Neutrophils were isolated using differential centrifugation and hypotonic lysis of red blood cells. Isolated neutrophils were used for RNA isolation using Trizol (Sigma-Aldrich, St Louis, MO), RNA with integrity number > 7 determined using a Bioanalyzer (Agilent) was converted to cDNA using the RETROscript kit (Ambion, Grand Island, NY). The human Toll-like Receptor signaling pathway RT^2 PCR Array (Qiagen, Valencia, CA) was used to profile the expression of 84 genes involved in TLR-mediated signal transduction and innate immunity. The Livak method was used to calculate the fold change in transcription compared to the control. The house keeping gene GAPDH was used to normalize the data. At the beginning of the experiment 15 to 48 genes were detected across treatment groups. At wk 4, all 84 genes were expressed in the hot treatment group, 8 genes in the control and 9 genes in the cold treatment group. Administration of the hot extract increased the number of TLR expressed from 3 to 10 and decreased from 2 to 1 and 6 to 0 in the cold extract and control groups respectively over the 4-wk period. Goat neutrophils can express all ten TLR. This mushroom based probiotic modulates expression of genes in the TLR signaling pathway. Extract specific effects need further study.

Keywords: Neutrophils and toll-like receptors

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098 Effect of sire breed on gain, carcass characteristics and parasite resistance of Katahdin crossbred feedlot-finished lambs.

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Improvement of carcass merit while maintaining parasite resistance in crossbred hair sheep progeny has potential to affect profitability for Katahdin breeders. To determine parasite resistance, ADG and carcass merit, Katahdin ewes from Virginia Tech were mated to Katahdin (KT), Suffolk (SU) or Texel (TX) rams. Lambs were born and raised in confinement until weaning, then shipped to the West Virginia University Animal Science Farm. Lambs were transitioned onto a complete pelleted diet (16% CP) and were fed *ad libitum* throughout the study. After 10-d transition period, all lambs (n =10/sire breed) were infected with 10,000 *Haemonchus contortus* larvae and weight, and blood and fecal samples were collected weekly. After 5 wk, all lambs were treated with levamisole (8mg/kg) and infected 3 wk later with another 10,000 *H. contortus* larvae. Ultrasonic determination of REA and fat depth occurred one wk prior to the end of the 90-d study. Upon study completion, 5 lambs from each sire group were randomly selected for carcass analysis at the Virginia Tech Meats Laboratory. Analysis of parasitological data indicated no effect of sire during the primary infection; however, sire effects were observed during challenge infection as KT-sired lambs had greatest ($P < 0.01$) fecal egg count (757 eggs/g) vs SU (266 eggs/g) and TX (462 eggs/g). Upon slaughter, no differences in worm burden of sire groups were observed and no difference was found in growth data between sire groups; however, SU-sired lambs tended to have greater ($P = 0.051$) ADG vs. KT (0.40 vs. 0.32 kg/d, respectively) but no advantage ($P > 0.05$) compared to TX-sired lambs (0.35 kg/d). Analysis of REA using ultrasound and direct carcass measurements revealed no difference between SU- (17.2 cm^2) or TX-sired lambs (19.6 cm^2), however, both groups were different than Katahdin lambs (13.73cm^2; $P < 0.01$). Leg score favored TX (12.8) and SU (12.0) lambs vs KU-sired lambs (11.0; $P < 0.05$). Data demonstrated that gain and carcass merit of TX-sired lambs is equivalent to SU-sired lambs providing data to support use of alternative terminal sires in Katahdin crossbreeding programs without impacting parasite resistance of crossbred progeny.

Keywords: carcass merit, parasite resistance, terminal sire

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099 Effect of fish meal supplementation rate on parasitism and performance of grazing lambs.

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Previous studies indicated that lambs supplemented with fish meal when rotationally grazed (using 3-d rotation) had less gastrointestinal nematode (GIN) fecal egg counts (FEC) but failed to gain at an acceptable rate. Thus, the objective of this study was to determine effect of increasing grazing time (GR) and supplementation rate (SR) on parasitism and performance of grazing lambs. Forty-eight Suffolk x Dorset crossbred lambs were randomly assigned to one of four treatment groups (n = 12/group), which included group A (1% SR and 3 d GR) group B (1% SR, 12 d GR), group C (2% SR, 3 d GR), and group D (2% SR, 12 d GR). Pasture-raised lambs were weaned and then moved to an elevated floor barn and treated with levamisole (8 mg/kg). Two weeks later, FEC was determined to be < 50 eggs/g; all lambs were then administered 10,000 *Haemonchus contortus* larvae. Simultaneously, lambs were transitioned to a supplement composed of corn, soybean meal, and fish meal, (19% CP) when housed in barn. Lambs were grazed for 10 wk and fecal, blood and BW data were collected at 2 wk intervals. All FEC data were log transformed using the formula log (FEC + 25) for analysis. Analysis of PCV revealed no differences between groups, which supports previous data that indicated supplementation with greater CP compensated for N loss due to blood feeding by *H. contortus*. No SR×GL interaction was observed for analysis of gain, however, SR significantly affected gain. Lambs receiving SR at 2% gained 9.38 ± 0.73 kg whereas lambs receiving SR at 1% gained 3.94 ± 0.71 kg ($P < 0.001$). Taken over 70 d, lambs receiving 2% SR had an ADG of 0.17 ± 0.015 kg/d vs. 0.06 ± 0.015 kg/d for lambs receiving 1% SR. A similar effect was observed for FEC as no SR × GL interaction was observed, yet lambs receiving 1% SR had a greater FEC (1158 ± 147 eggs/g) than 2% SR (467 ± 153; $P < 0.001$). Data demonstrated that lambs supplemented at a rate of 2% BW with a 19% CP ration had less FEC and greater ADG while grazing. Results provide additional means whereby producers can mitigate effects of GIN parasitism on grazing lamb growth.

Key words: fishmeal, grazing, lamb performance

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100 The effects of mixed and sequential grazing on growth performances and parasitic resistances of kids.

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Mixed-sequential grazing of cattle and goats can increase the efficient utilization of forages, reduce parasitic loads and increase economic benefits for small livestock producers. A mixed-sequential species grazing experiment was designed to measure the growth and parasitic burden in goats. In a completely randomized design, thirty two "Spanish" kids and 24 Brangus calves were randomly assigned to four treatment groups: (1) goats grazing alone (GTA); (2) cattle and goats grazing together (MXD); (3) cattle followed by goats (CFG); and (4) goats followed by cattle (GFC). Approximately 26 ha was divided into three 8-ha and one 2-ha Bermuda-grass (Cynodon dactylon) pastures. Each pasture was divided into two grazing areas (replications), where each replication was sub-divided into 8 grazing paddocks to facilitate intensive grazing using electric fencing. The one 2-ha pasture was used for the GTA treatment and the rest were used for CFG, GFC and MXD treatment groups. Initial stocking rates were 0.1 ha/doe and 0.8 ha/cow. After an adjustment period of 2 wk, initial measurements were taken and animals stayed in the experiment for 8 wk. Body weight, heart girth (HG), BCS, Famacha scores (FS) and pellet fecal score (PFS, 1 = watery to 5 = extremely dry) were measured on alternate weeks. Data were analyzed using SAS MIXED procedure and means were compared using the Tukey test and considered significant at $P < 0.05$. No differences among treatments groups were observed in BCS or PFS in kids. Kids in GFC group had the least FS (2.45 ± 0.08) while those in GTA has the greatest (2.76 ± 0.08; $P <$ 0.05). Greatest BW was observed in kids in MXD (25.1 ± 1.1 kg) while kids in CFG were the lightest (16.4 ± 1.0, $P < 0.05$). Kids in GFC (22.6 ± 1.1 kg) and in GTA (20.5 ± 1.2 kg) were similar ($P > 0.05$) in BW. Greatest HG measurements were observed in kids in GFC (75.3 ± 1.4 cm) followed by MXD and CFG (69.4 ± 1.4 and 68.1 ± 1.6 cm) groups; GTA group had the least HG values ($P < 0.05$). In summary, kids in GFC and MXD were superior in BW, FS, and HG over the other treatment groups, asserting that mixed and sequential grazing improve animal performances in cattle and goat.

Key words: growth, mixed grazing, parasitic load, sequential grazing

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101 Use of Agro-byproducts to Supplement Hair and Wool x Hair Crossbred Lambs Grazing Fescue Pasture: Growth and Gastrointestinal Parasites.

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Variations in forage quality and availability will influence lamb growth on pasture; supplementation is one option to address this limitation. This study evaluated the effect of soy hulls (SH; 13.9% CP; 48.7% ADF; 54% TDN) and corn gluten feed (CGF; 17.9% CP; 17.0% ADF; 76% TDN) supplementation on performance of hair sheep and wool × hair sheep lambs during spring grazing. Thirty-six, 7.5-mo old purebred hair sheep (Barbados Blackbelly and St. Croix) and crossbred wool (Dorset) × hair sheep lambs rotationally grazed predominantly Jesup tall fescue with Max-Q endophyte pasture (9.0 to 16.7% CP; 41.2 to 58.5% ADF; 46 to 59% TDN) from late March to early June. Lambs were assigned to a pasture-only, or a SH- or CGF-supplemented group balanced by breed type. Lambs grazed as a single group and were moved to a new pasture strip at 3 to 6-d intervals based on visual appraisal of forage availability. Supplement was provided at 2% of BW daily with individual Calan feeding stations. Body weight and BCS, FAMACHA anemia score (FA), and fecal egg counts (FEC) were monitored at 14-d intervals and supplement adjusted at that time. Packed cell volume (PCV) was determined at the end of the 77-d grazing trial. *Haemonchus contortus* represented 84% of the gastrointestinal worm burden. Data were analyzed in a model with breed type (purebred vs. crossbred) and diet (pasture-only vs. pasture plus SH vs. pasture plus CGF) as main effects, and initial BW as a covariate. Fecal egg counts were analyzed after log conversion and were presented as arithmetic means. Final BW and ADG were greater ($P < 0.001$) in crossbred than purebred (42.0 vs. 38.5 kg, and; 185 vs.140 g/d; respectively), and supplemented than pasture-only (43.7 vs. 36.8 kg and 207 vs. 118 g/d; respectively) lambs, but were not different between breed types on pasture-only (breed type × diet interaction: $P < 0.05$). Final BW and ADG were also similar ($P > 0.10$) between the two supplement types. Body condition and PCV were greater ($P < 0.05$), and FEC less in supplemented than pasture-only lambs, but not affected by breed type ($P > 0.10$), while FA was less ($P < 0.01$) in purebred lambs (1.03 vs. 1.69), but not affected by diet ($P > 0.10$). Results showed supplementation to have a greater impact on growth rate in crossbred than purebred hair sheep lambs, but type of supplement apparently had no effect.

Key words: Hair Sheep; Rotational grazing; Supplementation

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102 Use of agro-byproducts to supplement hair and wool x hair crossbred lambs grazing fescue pasture: carcass characteristics.

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Pasture alone does not always provide adequate nutrients for growing lambs because of variations in forage quality and availability. Supplementation of grazing lambs is one option to address this limitation, and this study evaluated the effect of soy hull (SH; 13.9% CP; 48.7% ADF; 54% TDN) and corn gluten feed (CGF; 17.9% CP; 17.0% ADF; 76% TDN) supplementation on performance of hair sheep and wool × hair sheep lambs during spring grazing. Thirty-six, 7.5-mo old purebred hair (Barbados Blackbelly and St. Croix) and crossbred wool (Dorset) × hair sheep lambs rotationally grazed predominantly Jesup tall fescue with Max-Q endophyte pasture (9.0 to 16.7% CP; 41.2 to 58.5% ADF; 46 to 59% TDN) from late March to early June. Lambs were randomly assigned to a pasture-only, and a SH or CGF supplemented group balanced by breed type. Lambs grazed as a single group and were moved to a new pasture strip at 3 to 6 d intervals based on visual appraisal of forage availability. Supplement was provided daily at 2% of BW (DM basis) at individual Calan feeding stations. Carcass traits were evaluated after slaughtering with standard procedures at the end of the 77 d grazing period. All data were analyzed as a completely randomized design with a 2 × 3 factorial treatment arrangement: breed type (pure- or cross-bred) with or without supplementation (SH and CGF or pasture-only). Hot carcass weight (HCW) was greater ($P < 0.001$) in crossbred than purebred lambs, but dressing percentage was not affected by breed type. Furthermore, HCW (17.5 or 17.6 vs. 13.3 kg) and dressing percentage (45.2 or 44.1 vs. 41.1%) were greater ($P < 0.01$) in supplemented (SH or CGF) vs. pasture-only lambs, respectively. Muscle pH after 24-h post-mortem was not influenced ($P = 0.39$) by breed type or supplementation. Loin eye area was greater (15.6 vs. 13.0 cm^2; $P < 0.05$) in crossbred than purebred lambs. All cuts from fore- and hind-saddles were greater ($P < 0.01$) in crossbred than purebred lambs, except neck cuts, and also greater ($P < 0.01$) in supplemented than pasture-only lambs. Results indicated that supplementation and crossbreeding had significant effects on carcass quality.

Key words: carcass characteristics, hair sheep, supplementation

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103 Effects of *Lespedeza cuneata* and *Pinus maritima* condensed tannin extract on ovine Eimeria spp. development and infectivity.

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Proanthocyanidins are a group of polyphenols found naturally in plants, these molecules are included in a larger category more commonly known as condensed tannins (CT). These micronutrients help defend plants against pathogens such as viruses and bacteria. Sericea lespedeza *(Lespedeza cuneata)* has been shown by our lab to reduce both fecal egg count (FEC) and fecal oocyst count (FOC) in small ruminants. Due to the defensive properties of CT, it is possible that the proanthocyandins may bind to the cuticle of nematodes, resulting in rigidity of the cuticle and prohibiting proper movement. Little is known however about a potential mechanism of action (MOA) for *Eimeria* spp. This apicomplexan protozoa is responsible for the disease coccidiosis, one of the most devastating parasitic diseases of young small ruminants. Once inside a host, *Eimeria* spp. undergo several rounds of asexual and sexual reproduction. These reproductive life cycles directly cause damage to the intestinal lining of the infected host. Currently, the best form of control in small ruminants is prevention, as there are no FDA approved medications for treating active infections in small ruminants. For this reason it is essential that alternative forms of treatment and their MOA be investigated. In this study ovine and caprine *Eimeria* spp. were exposed to varying concentrations of a CT extract made from fresh SL. After exposure to the aqueous solution of tannins, the oocysts were allowed to sporulate. Upon completion and analysis of the sporulation and excystation assays, no significant differences were noted in sporulation rates, however strong trends suggest the tannins are acting on the sporozoites. It appears that the PB powder extract had the greatest effect on excystation, in a positive manner, creating an increased amount of excystation when compared to the control samples. The liquid SL extract however had the greatest negative effect on excystation. Interestingly however, the diluted (50%) liquid SL extract had a greater negative impact on excystation than the 100% SL extract. Future work will include use of a primary cell line of ovine or caprine cells and any subsequent sporozoites will be monitored for cell invasion and schizont development. At the end of this study we hope to have a better understanding of the MOA of Sericea lespedeza in controlling and treating *Eimeria* spp.

Key words: Eimeria, Tannins, Sheep

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104 Condensed tannins-Induced Gene Expression in Meat Goats: A pilot study.

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The objective of this study was to determine whether the condensed tannin (**CT**)-containing sericea lespedeza leaf pellet (**SLP**, *Lespedeza cuneata*; 13.6% CT), ground pine bark (**PB**; *Pinus*; 16.3% CT), or its combination would have any effects on gene expression in meat goats. Twenty-four Kiko-crossbreed intact male goats (*Capra hircus*; BW = 38.6 ± 2.7 kg) were randomly assigned to 4 treatments (n = 6/treatment; ad libitum): 1) 30% bermudagrass (*Cynodon dactylon*) hay (0.15% CT) and 70% grain mix (0.12% CT), 2) 30% PB and 70% grain mix, 3) 30% SLP and 70% grain mix, and 4) 15% PB, 15% SLP, and 70% grain mix. Each treatment diet (30%) was mixed with the remainder of each diet containing 70% commercial sweet feed (Triumph® 12% Sweet Horse Feed) and 30% alfalfa pellets for a 42-d trial. All goats were slaughtered at the end of the study (d 42) and liver samples collected from each animal. Samples were immediately frozen at −80°C for future study. Total RNA was extracted using Trizol (Invitrogen, Gaithersburg, MD) according to manufacturer's instructions. Individual RNA samples were pooled (15 μL/sample) for analysis from 6 RNA samples. To identify by CT-containing dietary treatment, paired-end RNA-seq was performed on pooled samples of goat livers from each group and to identify gene responses among diets. Data were processed by the Kal's Z test to evaluating the proportional changes of each of the candidate genes. Feeding the PB diet affected both negative (downregulated) responses, including T cell activation (−20), protein coding genes (−11.3), protein kinase (−18.2), and potassium regulator (−10.4), or positive expression (up regulated) of protein-coding genes (342.9), protein kinase (89.0), lysine (K)-specific methyltransferase (80), potassium (60.5), Zn-finger protein (59.8), tumor suppressor (30.3), and iron sulfur domain (13.3) compared to control diet. Goats fed the SLP diet affected both negative responses, including ribosomal protein (−19.0), amino acids transporter (−15), thyroid hormone receptor (−13.6), Zn-finger protein (−11.8), glycerol kinase (−10.8), and immunoglobulin domains (−10.6), or positively impacted protein metabolism genes (17.5), cell division (13.6), Ca (10.4), Zn (10.6), and Mg-finger proteins (10.1) compared to control. Feeding PB and SLP mixed diets also showed varied responses in goat gene expression. Data suggested that CT-containing forages can employ either a negative or positive effect on goat gene expression and it is possible that this effect is dependent on CT source.

Key words: Condensed tannins, gene expression, goats, liver

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105 The influence of breed and supplementation on consumer ratings of meat quality attributes of pasture-raised ground lamb meat.

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Consumer acceptance and influence of breed and feed supplementation on consumer ratings of ground hair sheep lamb meat quality characteristics were investigated. Ground lamb meat was obtained from purebred hair sheep lambs (PB; $n = 23$; Barbados Blackbelly or St. Croix) and crossbred wool × hair sheep lambs (CB; $n = 24$; Dorset × Barbados Blackbelly or Dorset × St. Croix) of both sexes harvested at 8 mo. of age. Previously, lambs were rotationally grazed for 90 d during summer, predominately on tall fescue only (PAS) or additional soy hull supplement (SUP) at 2.0% of BW (DM basis) at individual feeding stations (Calan gates). Carcasses were pooled according to production type and ground lamb packages labeled accordingly (A = PB×PAS only, B = CB×PAS only, C = PB×SUP, and D = CB×SUP). Customers ($n = 284$) of a local food hub company randomly received a 500-g package of ground lamb labeled either A, B, C, or D with no other information provided. Participants received identical recipes and requested to complete a survey rating each product for selected qualitative characteristics (1 = extremely undesirable to 9 = extremely desirable). Previous consumption, the price range they would be willing to pay, if and how often they would purchase the product, and preferred lamb products were also asked. Responses were analyzed using means, frequency, and npar1way procedures of SAS; survey response rate was 74%. Respondents rated cooked ground lamb from CB lambs greater ($P < 0.03$) in both color (7.5 ± 1.2 and 7.1 ± 1.5, respectively) and tenderness (7.9 ± 0.9 and 7.4 ± 1.3, respectively). Participants also rated the color of cooked product ($P < 0.04$) greater for SUP compared to PAS ground lamb (7.5 ± 1.2 and 7.1 ± 1.5, respectively), while tenderness was rated greater ($P < 0.03$) in PAS lambs (7.7 ± 1.3 and 7.5 ± 1.0, respectively). Overall, taste was influenced by breed and supplementation with ground meat from B (6.7 ± 0.4) rated least ($P < 0.04$) desirable (7.6 ± 0.4, 7.2 ± 0.3 and 8.8 ± 0.3 for A, C, and D, respectively). Ninety-six percent indicated they would purchase local ground lamb; 59%, at least once/month, and 4%, weekly. Forty-three percent indicated that they would pay a premium (> $13.2/kg) for ground lamb meat. Consumer interest exists for fabricated ground lamb products, especially gyro loaf (60%), sausage links (46%), and burgers (41%). In conclusion, ground meat from hair sheep lambs could provide an opportunity to enhance profitability for small-scale producers in Virginia.

Key words: hair sheep, meat quality, pasture

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106 Carcass and fatty acid profile of pen-fed and pasture-raised meat goat kids.

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Carcass and fatty acid data from pen-fed and pasture-raised goats were compared for 2 yr. In 2013 and 2014, thirty Kiko bucklings were randomly assigned to two feeding regimes. PEN goats were zero-grazed and fed a diet of mixed hay and whole barley. PASTURE goats consumed a pasture diet, grazing alongside bucks in the Western Maryland Pasture-Based Meat Goat Performance Test. After an adjustment period, bucks consumed their respective diets for 84-d and were then harvested. Carcasses were deboned and measurements recorded. A sample of the LM was removed from each carcass for fatty acid analysis. All data were analyzed using the GLM procedure of SAS with animal as the experimental unit and class variables including treatment and ID. PEN goats produced larger, more heavily muscled carcasses compared to PASTURE goats ($P < 0.01$; LW: 33.0 ± 0.7 and 25.7 ± 0.8 kg; HCW: 14.0 ± 0.4 and 10.1 ± 0.4 kg; CCW: 12.8 ± 0.3 and 9.1 ± 0.4 kg, respectively). PEN goats had greater ($P < 0.01$) intramuscular fat in 2014 (0.3 ± 0.02 kg) compared to 2013 (0.2 ± 0.02 kg) and PASTURE goats in both years had less ($P < 0.01$) intramuscular fat compared to PEN goats (0.04 ± 0.04 and 0.32 ± 0.03 in 2013 and 0.20 ± 0.03 and 0.43 ± 0.03 kg in 2014 for PASTURE and PEN, respectively). The most plentiful fatty acids identified in the meat were palmitic (C16; 17.9% and 18.5%, for 2013 and 2014, respectively), stearic (C18; 17.5% and 17.3% for 2013 and 2014, respectively), and oleic (C181c9; 32.5% and 33.9% for 2013 and 2014, respectively). In both years, PEN goats had greater ($P < 0.01$) percentages of palmitic (19.6 ± 0.3 and 16.2 ± 0.4% in 2013 and 20.0 ± 0.5 and 16.8 ± 0.5% in 2014, respectively) and oleic acid 939.2 ± 1.1 and 25.3 ± 1.1 in 2013 and 38.1 ± 1.3 and 29.3 ± 1.3 in 2014, respectively) while the PASTURE goats had greater percentages of stearic acid (18.6 ± 0.4 and 14.6 ± 0.4 in 2013 and 18.5 ± 0.5 and 16.1 ± 0.5 in 2014, respectively). In 2013, PASTURE goats had a lower percentage of SFAs ($P < 0.04$; 38.4 ± 0.4 vs.39.6 ± 0.4%), higher percentage of UFAs ($P < 0.02$; 59.8 ± 0.4 vs. 58.5 ± 0.4%), greater ratio of UFA:SFA ($p < 0.03$; 1.56 ± 0.03 vs. 1.48 ± 0.03%), and higher content of CLA ($P < 0.01$; 1.8 ± 0.07 vs. 0.8 ± 0.07%). In 2014, there were no differences in these measures. Differences in years, along with minute differences in fatty acid content, makes it difficult to conclude that diet has an effect on the healthiness of goat meat. Producers should be able to finish their goats in the most profitable way without affecting the health of their end product.

Key words: carcass, goats, meat, fatty acids

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107 Effect of semen extender and storage temperature on ram sperm motility over time.

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Viability of stored chilled extended semen from rams is dependent on factors such as type of extender and storage temperature. The objective was to determine the effect of semen extender and storage temperature on motility of ram semen for up to 72 h. Semen with at least 35% motile sperm was collected by electroejaculation from 3 mature and 2 yearling Katahdin rams. Each semen collection was extended using four different extenders: milk (Mi), Tris-citrate (Tc), Tes-tris (Tt), and sodium-free (CJ2). Semen was diluted to 600 million sperm/mL and loaded into 0.25-mL straws for storage at 4°C or 15°C. All extenders were supplemented with 5% egg yolk. Percentage motile (path velocity $\geq$ 30 µm/sec and progressive velocity $\geq$ 15 µm/sec) and progressive (path velocity $\geq$ 50 µm/sec and straightness $\geq$ 70%) sperm were determined at 0, 24, 48, and 72 h of storage using computer-assisted system analysis. Data were analyzed using the PROC MIXED procedure of SAS, with semen collection as the experimental unit. Variables in the model included extenders, temperatures, hour (repeated measures) and interactions. Percentage motile sperm decreased ($P < 0.01$) over time, regardless of extender. The decrease in motile ($P = 0.36$) and progressive sperm ($P = 0.26$) motility was similar between storage temperatures. Sperm motility was greater ($P < 0.05$) in Tc (49.5 ± 2.7%) than other extenders, but similar ($P > 0.05$) between Tt (39 ± 2.7%) and Mi (34.8 ± 2.7%). Sperm in Tt extender had greater motility ($P < 0.05$) than those in CJ2 (27.4 ± 2.7%). There was an extender by storage time interaction ($P < 0.01$), with sperm motility declining more rapidly in CJ2 than in other extenders. Within 24 h, percentage of progressively motile sperm decreased ($P < 0.01$) from a mean of 35.2 ± 1.0% to a mean of 8.6 ± 1.0%. Between 24 and 72 h, percentage of progressively motile sperm decreased ($P < 0.01$) to 3.3 ± 1.0%. Decrease in progressive motility was observed across all extenders. Results indicated that progressive motility of ram sperm is greatly reduced within 24 h or storage, regardless of extender or storage temperature.

Key words: artificial insemination, semen extenders, sheep

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108 Evaluation of terminal sire breeds for hair sheep production systems on lamb birth, weaning, and grazing performance.

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Terminal sire crossbreeding systems can improve growth performance while maintaining parasite tolerance, and have potential to enhance profitability of hair sheep enterprises. This study was designed to examine effects of sire breed on lamb performance and parasitism from birth through a 90-d summer grazing season. Katahdin (KT; $n = 3$), Suffolk (SU; $n = 1$), and Texel (TX; $n = 1$) rams were randomly mated to KT ewes at the Virginia Tech Southwest Agricultural Research and Extension Center. Post-lambing, ewes and lambs were managed on fescue pasture until weaning (70-d age) at which time lambs were moved to an ungrazed fescue pasture and supplemented with a concentrate pellet (13% CP, 75% TDN) at 2.0% BW AF daily for the 90-d summer grazing season. At weaning and during this summer grazing season, BW, Haemonchus contortus egg count/g of feces (FEC), and FAMACHA scores were collected every 14-d. Deworming was performed as necessary based on FAMACHA score ($\geq$ 3 utilized as the basis for deworming). All statistical analyses were conducted using JMP (SAS Institute Inc., Cary, NC). Tukey's HSD test was used for a comparative means analysis. Body weight at birth was greater for SU-sired ($n = 20$) than KT-sired ($n = 38$) lambs (4.6 vs. 4.2 kg, $P < 0.05$), although no differences were observed in lambing difficulty. Death loss from birth to weaning (death loss/ewe lambing) was greatest for SU-sired lambs (0.43; $n = 21$), which differed from both TX-sired (0.11; $P < 0.05$; $n = 18$) and KT-sired (0.08; $P < 0.01$; $n = 60$). Weaning BW, adjusted for lambs age, gender, dam age, and birth/rear type, differed between TX and KT-sired lambs (26.3 vs. 23.8 kg, $P < 0.01$), with SU-sired being intermediate (25.6 kg). The TX-sired lambs had greater ($P < 0.05$) BW (35.1 kg) than SU-sired (BW = 30.8 kg) and KT-sired (BW = 29.2 kg) at the conclusion of the summer grazing season, and exhibited greater ADG than KT-sired (0.09 vs. 0.06 kg/d; $P < 0.01$). FEC varied over time ($P < 0.05$). However, there were no sire effects for FEC. There was a tendency ($P = 0.08$) for a greater percentage of SU-sired lambs to require deworming compared to KT-sired lambs (90% vs. 63%). Results indicated the potential for Texel as terminal sires in hair sheep production systems to increase lamb BW and maintain parasite tolerance.

Key words: parasite resistance, performance, sheep

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SMALL RUMINANT PRODUCTION II

109 Effect of sire breed on pregnancy rate in landrace hair sheep during summer Mating.

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Caribbean hair sheep breeds are aseasonal breeders in their native environment and display extended seasonal breeding under temperate environments, thus facilitating their use in accelerated mating. This project introduced terminal sire mating into an accelerated hair sheep production system, and here we evaluated the influence of sire breed on fertility during the transitional breeding season. A flock of 112 purebred Barbados Blackbelly (BB) and St. Croix (SC) ewes were mated in July as part of an accelerated breeding system. In this system, ewes were managed on pasture and lambs weaned 2 to 4 wk before mating. Before breeding, ewes were fed supplement containing 0.3 mg/(head · d) melengestrol acetate at 1% of BW for 10 d to synchronize estrus. Ewes were randomly allocated by breed type to be bred by like-breed sires or Dorset (DO) rams in single sire groups of 10 to 18 ewes (3 BB, 3 SC, and 3 DO sire groups). Rams had passed a breeding soundness examination before breeding and were fitted with a marking harness. Estrus marks were recorded daily when ewes were fed corn supplement at 0.5% BW (DM basis). Pregnancy was determined at the end of the 30-d mating period and again 21 d later by transrectal ultrasonography. Data were collected during two July mating periods, using a total of 5 BB, 6 SC and 5 DO rams, and were analyzed using Chi-square to determine effects of mating type (purebred vs. crossbred) on pregnancy rate and rebreeding frequency. Overall pregnancy rate was greater in purebred than crossbred matings (95.8% vs. 68.9%, respectively; $P < 0.01$) and different between years (88.5% vs. 78.2%, respectively; $P < 0.05$). The pregnancy rate to the initial synchronized estrus was greater ($P < 0.001$) purebred than crossbred matings (77.5 vs. 27.2%) and contributed to the difference in overall pregnancy rates between mating types. Concurrently, incidence of repeat breeding marks was greater in crossbred than purebred matings (37.9 vs. 18.6%, respectively; $P < 0.01$), and resulted in a later average breeding date for crossbred matings after onset of the breeding season (15.2 vs. 6.2 d, respectively; $P < 0.001$). Data indicated that fertility of DO rams in a July mating was less than in BB and SC rams, which could impact the lamb crop produced. The later breeding date will also affect ewe rebreeding performance under an accelerated mating system.

Key words: Transitional breeding; Hair sheep; Pregnancy rate

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110 Use of fecal NIRS to predict red cedar intake by goats.

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The objective of this study was to develop a NIRS calibration equation for fecal samples so that the percent red cedar in the diet could be predicted in a vegetation management study. Thirty Boer yearling wethers (45.3, SD = 9.4 kg initial BW) were penned individually and assigned to one of 5 basal diets (basal concentrate, alfalfa pellets, chopped native grass hay, chopped mixed hay or chopped wheat hay). Five levels of fresh harvested red cedar needles (0, 6, 12, 18, and 24% of dietary DM) were substituted for the basal diet, 1 wk at each level. Five basal diets were used to make the prediction equation robust across diets (prevent confounding between cedar level and basal diet level). Fecal samples were collected for the last 3 d during each feeding week using fecal bags for approximately 2h/d. Fecal samples were dried at 65°C and ground in a Cyclotec^{tm} mill to pass a 1 mm screen. Fecal samples were scanned from 680 nm to 2500 nm using a Unity Spectra Star^{m} NIR spectrophotometer. Wethers fed chopped wheat hay had lower total feed intake ($P < 0.01$) compared to all other basal diets. Total feed intake and basal diet intake were not affected by red cedar levels ($P > 0.05$). Basal diet intake was higher ($P < 0.01$) for wethers consuming the basal concentrate or alfalfa pellets compared to wethers fed any of the chopped hays. Red cedar intake was lower ($P < 0.01$) for wethers fed basal concentrate compared to all other diets. A prediction equation was developed using red cedar intake reference data and fecal spectra data using UCal^{tm} software. The predictive equation had a $R^2$of 0.83 and a standard error of calibration of 3.37%. This equation should be suitable for predicting red cedar intake from fecal samples of grazing goats.

Key words: Near Infrared Spectroscopy, fecal analysis, red cedar, goat

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111 Effects of dietary AcidBuf supplementation with different levels of salt on productive performance and carcass characteristics of growing lambs.

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Thirty 4-mo-old Awassi male lambs (BW 23.5 ± 1.3 kg) were used in a 70-d trial to evaluate the effects of supplemental AcidBuf (calcified seaweed extract) with different levels of salt (sodium chloride) on performance, metabolic profile, carcass characteristics and meat quality of growing lambs. Animals were individually housed in shaded pens and randomly divided into 6 groups of 5 lambs each. The dietary treatments were: 1) no added supplemental AcidBuf or salt (control group; the basal

diet), 2) 0.4% added AcidBuf (A+S0.0), 3) 0.4% added AcidBuf + 0.4% added salt (A+S0.4), 4) 0.4% added AcidBuf + 0.8% added salt (A+S0.8), 5) 0.4% added AcidBuf + 0.1.2% added salt (A+S1.2), and 6) 0.4% added AcidBuf + 1.6% added salt (A+S1.6). The basal diet was used a commercial total mixed ration, containing 1.95 Mcal M_{Em} and 13.0% CP/kg. Feed intake was measured weekly and lambs were weighed on d 1, 15, 30, 45, 60, and 70. Blood samples were collected on d 1, 30, 60, and 70 for measurement of biochemical variables. Lambs were slaughtered on d 70 to evaluate carcass characteristics and meat quality. ADG, G: F and HCW were greatest ($P < 0.05$) for lambs on the A+S0.8 diet. Lambs fed the A+B1.2 had elevated ($P < 0.05$) plasma bicarbonate and total CO_2 concentrations compared with lambs fed the control diet. The addition of AcidBuf plus salt at level of 1.2% improved carcass characteristics in term of a decreased back fat thickness ($P = 0.03$) by 10.8%, and an increased LM ($P < 0.05$) by 12.3%, compared with un-supplemented lambs. Results indicated that adding AcidBuf plus salt at 0.8 or 1.2% had a positive effect on growth performance and carcass characteristics, which has important implications for the sheep industry. Different salt sources and concentrations can be used in further studies to elucidate most advantageous regarding productive variables, availability and cost for sheep industry.

Key words: AcidBuf, growing lambs, salt

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112 Effect of nutritional supplementation and gonadotropin stimulation on fertility of early postpartum lactating ewes.

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This study evaluated the effect of lactation, exogenous gonadotropin (GS), and nutritional supplementation on fertility of Katahdin ewes during seasonal anestrous. Experiment 1 evaluated effects of lactation and GS on fertility. Lactating (65 to 80 d postpartum) and dry ewes were treated with an estrus induction protocol (EIP) consisting of a 5-d treatment with a CIDR device with ($n = 41$) or without ($n = 38$) a gonadotropin mixture (P.G. 600®; 240 IU eCG and 120 IU hCG; 3 mL/animal i.m.) at removal of CIDRs. In Experiment 2, effects of both level of nutritional supplementation and GS on fertility of lactating ewes were evaluated. Lactating ewes ($n = 100$) on pasture, were assigned randomly and then balanced for litter size to receive either a low or high amount of grain supplementation (16% CP; 0.68 kg or1.14 kg/d/animal; equivalent to 30 and 50% of projected DMI) from 1.5 to 2.5 mo postpartum and then treated with EIP with or without GS. Chi-square analysis was used to evaluate the main effects and their interactions on response variables. In experiment 1, mean estrous response (50.7 ± 5.6%) did not vary with lactation status ($P = 0.33$) but was greater in animals receiving than those not receiving GS (64 ± 8 and 39 ± 8%; $P = 0.05$). Pregnancy rate (PR) was greater in dry than in lactating ewes (57.2 ± 10 and 26.5 ± 7%; $P = 0.01$. In Experiment 2, estrous response was greater in ewes receiving than in those not receiving GS ($P < 0.001$; 67.4 ± 7 and 33.6 ± 7%, respectively) and tended to be greater in ewes receiving the high vs. low level of supplementation ($P = 0.10$; 58.6 ± 8 and 42.3 ± 6%, respectively). The PR was increased by GS ($P = 0.003$; 49 ± 7 and 19.9 ± 7%, for ewes receiving and not receiving GS, respectively) and by increasing the amount of supplement ($P = 0.05$; 43.8 ± 8 and 25.1 ± 6%, for ewes receiving the high and low level of supplementation, respectively). The GS X nutritional supplementation was not significant for any of the variables measured ($P > 0.1$). In conclusion, during anestrous, early postpartum fertility is reduced by lactation in Katahdin ewes, but fertility in lactating ewes can be increased to that of dry ewes with nutritional supplementation and by providing GS as part of the EIP.

Key words: anestrous, fertility, lactation

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113 Quantification of mRNA Expression for the Estrogen-Regulated Gene ISYNA1 in the Goat Testis.

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SRP 12785: Quantification of mRNA expression for the estrogen-regulated gene ISYNA1 in the goat testis Inositol-1-phosphate synthase (ISYNA1) codes for myo-inositol phosphate synthase, which catalyzes the synthesis of myo-inositol. Myo-inositol, is key in cell membrane formation and normal physiology, cell signaling, and intracellular transport, all of which are critical to testicular function. Although ISYNA1 has been identified in human, murine, and rat testes, little is known about its role in testicular function, particularly in the goat for which there are no reports. This project aimed to quantify the mRNA expression of ISYNA1 in goat testes at different developmental stages to further characterize the role of ISYNA1 in the testis. Total RNA was extracted from testicular tissue obtained from neonatal ($n = 10$), pre-pubertal ($n = 9$), and post-pubertal ($n = 10$) goats and reverse-transcribed into cDNA. Quantitative PCR was performed on the cDNA of the testicular samples by using the SYBR Green method. Expression of ISYNA1 was significantly less ($P \leq 0.05$) in neonatal tissues (1.35 ± 0.83) when compared to pre-pubertal (4.45 ± 0.88) and post-pubertal (4.14 ± 0.83) tissues. Messenger RNA expression of ISYNA1 was not different ($P = 0.83$) between pre-pubertal and post-pubertal tissues. Further, preliminary western blot analysis for ISYNA1 antibody confirmed the presence of ISYNA1 protein (63kd) in adult testicular tissue. Future research is needed to localize this gene within the seminiferous epithelium. In summary, this is the first report of ISYNA1 in the goat testis, suggesting a possible

role for ISYNA1 in testicular function, which may include key processes such as cell signaling and intracellular transport.

Key words: ISYNA1, inositol, testis

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114 Blood profiles of kids in mixed and sequential grazing experiment.

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Internal parasite infestation of goats causes major health issues, which reduce the productivity of the animal and causes great economic loss to the producer. A mixed/sequential grazing experiment was designed to measure the blood parameters in kids as an indication of parasitic infestations. The experiment was designed as a completely randomized design with four grazing treatments, replicated twice. Treatments were: (1) goats grazing alone (GTA); (2) cattle and goats grazing together (MXD); (3) cattle followed by goats (CFG); and (4) goats followed by cattle (GFC). Thirty two Spanish kids and 24 Brangus calves were randomly assigned into four treatments. Approximately 26 ha was divided into three 8-ha and one 2-ha Bermuda-grass (*Cynodon dactylon*) pastures. Each pasture was divided into two grazing areas (replications), where each replication was sub-divided into 8 grazing paddocks to facilitate intensive grazing using electric fencing. After an adjustment period of 2 wk, animals stayed in the experiment for 10 wk from June to August of 2015. Blood and fecal samples were collected in alternate weeks. Blood was collected from the jugular vein with the use of the vacutainer system. Blood was analyzed with the VetScan HM5 for packed cell volume percent (PCV), white (WBC), red blood cells (RBC) and hemoglobin (HGB). Fecal samples were analyzed for fecal egg count (FEC as eggs per gram of material). Data were analyzed using SAS MIXED and CORR procedures and means were compared using the Tukey test and considered significant at $P < 0.05$. Except for FEC, significant treatment effects were observed in WBC, RBC, HGB and PVC. WBC was greatest in CFG, but similar in GFC, GTA and MXD (19.3 ± 0.9 vs. 15.7 ± 0.9, 16.4 ± 1.1 and 15.4 ± 1.1 c/μL, respectively) groups. The RBC in CFG and GFC were similar (13.7 ± 0.5 and 13.2 ± 0.5 but greater than GTA and MXD (11.2 ± 0.6 11.5 ± 0.6 c/μL) groups. Similar trends were observed in HGB and PCV where kids in CFG and GFC had greater values than GTA and MXD groups. The FEC was negatively correlated with HGB ($r = -0.19$) and PCV ($r = -0.20$). The WBC, RBC, HGB and PCV were positively correlated with each other. Results suggested that kids in sequential grazing (CFG and GFC) performed better than kids in GTA or MXD grazing treatments.

Key words: blood, goats, mixed and sequential grazing

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SYMPOSIUM ABSTRACTS: ANTIMICROBIAL RESISTANCE SYMPOSIUM

115 Antimicrobial resistance (AMR): Issues and solutions facing the livestock industry.

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Antimicrobial resistance (AMR) is an extremely critical, high profile issue for animal agriculture and food animal medicine. The current urgency and prominence of the AMR issue has been markedly accentuated by recent high level decisions and mandates (e.g., *"National Action Plan for Combating Antibiotic-Resistant Bacteria"* and *"National Strategy for Combating Antibiotic Resistant Bacteria"*; Presidential Executive Orders; *"Creating a Preference for Meat and Poultry Produced According to Responsible Antibiotic Use Policies",* Presidential Memorandum; "*Report to the President on Combating Antibiotic Resistance*", PCAST 2014; *"Antimicrobial Resistance Action Plan",* APHIS 2015). The intensified external scrutiny of antimicrobial use in food animal production is being met by responsive efforts of the livestock industry as well as animal and veterinary scientists. The vested and responsible parties must: a) define and implement 'stewardship' of antimicrobials appropriate for food animal agriculture; b) extend the lifespan of existing antibiotics and optimize the best ways to use them to protect animal and public health; c) discover new animal-only antibiotics and preserve their efficacy; and d) explore alternatives to antibiotics where feasible. This presentation will provide an overview of the issue and suggest an efficacious path forward to ensure human health, environmental health, and to continue the privilege to use therapeutic antimicrobial agents to meet the moral duty of providing appropriate care to the animals that serve humankind.

Key words: antimicrobial resistance; antibiotic resistance; antimicrobial alternative; AMR

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116 Methicillin-resistant Staphylococcus aureus (MRSA) in livestock production: An overview.

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Methicillin-Resistant *Staphylococcus aureus* (MRSA) is a leading cause of opportunistic infections in people. MRSA infections can range from skin infections to life-threatening bacteremia, pneumonia, and surgical site infections. Livestock including ruminants, swine, poultry, and even farmed rabbits can carry MRSA and people who work with these animals are

at increased risk for carriage of livestock-associated MRSA strains (LA-MRSA). Both humans and animals can carry *S. aureus* in their nasopharynx and on the skin, particularly warm, moist areas of the skin such as the axilla, groin, and perineum. Use of antibiotics can induce antimicrobial resistance (AMR) in bacteria, can select for resistant bacteria, and can reduce the population of susceptible indigenous flora that normally compete with resistant strains. Resistant bacteria can be transmitted between animals and man through direct contact, contact with food products of animal origin, and contamination of the environment. Once in the general population, these bacteria can be transmitted person-to-person. Livestock workers at all stages of animal production are at increased risk for carriage of LA-MRSA and are therefore at increased risk for opportunistic infections with LA-MRSA. Treatment of infections and decolonization protocols can be complicated by repeated exposure. The majority of the data regarding LA-MRSA comes from European studies and has primarily focused on swine production. The major European strain of LA-MRSA is CC398 and data indicate that there are multiple other strains of LA-MRSA in addition to CC398 in the U.S. It is important to note that CC398 in the U.S. has been found in people with no livestock exposure. Additionally, two independent studies of MRSA colonization of people living close to animal production facilities found that MRSA carriage was higher in people living close to farms or in areas where manure was spread, although neither study identified LA-MRSA strains among the isolates collected. Potential explanations include the transmission of AMR genes or the evolution of novel LA-MRSA strains, but there are insufficient data to make any conclusions. Ultimately, the current data indicate that there is complexity both in the LA-MRSA strains associated with livestock in the U.S. and in the movement of these bacteria between animals and people.

Key words: antimicrobial resistance; methicillin-resistant *Staphylococcus aureus*; MRSA

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117 Probiotics as an alternative for antimicrobials and improving energy availability.

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Probiotics and their associated derivatives (paraprobiotics) are frequently utilized to improve animal health and productivity. Much work has been conducted to decipher ways to improve the efficacy of probiotics. Recent work from our laboratory has characterized specific binding characteristics of probiotics that can facilitate their use as an alternative to antimicrobial therapies. The binding capability of five different yeast probiotics or paraprobiotics to Gram-negative bacteria (*Salmonella* sp. and *Escherichia coli* O157:H7) and Gram-positive bacteria (*Listeria monocytogenes* and *Clostridium* sp.) were analyzed. Our studies indicated that all bacteria tested bound with nearly equivalent efficiencies ($P > 0.05$) against the live yeast probiotics tested. However, much variation was observed in the binding efficiencies with the paraprobiotics. The Gram-positive bacteria had, as a group, a preference for binding to one paraprobiotic in comparison to the other two products analyzed ($P < 0.05$), whereas the Gram-negative bacteria had greater efficiency to bind to two paraprobiotics ($P < 0.001$). Work from our laboratory has also identified the potential use of probiotics to improve the availability of lipids to animals, thus potentially enabling an enhancement of the immune response in the presence of infections. A novel oleaginous bacterium *Enterobacter cloacae* strain JD6301 was found to increase the concentrations of circulating triglycerides (TAGs) and thus available energy in pigs and cattle. Preliminary studies have also indicated that providing pigs with *E. cloacae* for 5 d before being challenged with a pathogen led to an increase in fatty acids ($P < 0.05$) and triglycerides ($P < 0.04$) in comparison to controls and also had a reduction in pathogen prevalence. These data suggest that the use of probiotics and paraprobiotics as therapies needs to be specific to the pathogen of interest; thus indicating a need for "designer" probiotic/paraprobiotic feeding strategies. Further research is needed to determine whether these therapeutic approaches can enhance performance and gut health in livestock.

Key words: probiotics; antimicrobial alternative; gut health; AMR

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118 Phage applications in animal agriculture and food safety.

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There is increasing pressure to reduce antibiotic use in agricultural systems while maintaining or increasing the microbiological safety of foods at all stages of production. Bacterial pathogens in agricultural systems may reduce production yield, present a public health issue by their risk of transmission to humans, or both. A number of non-antibiotic strategies are available to control bacterial pathogens in agricultural systems, and the use of bacteriophages (phages) represents one such option. Phages are the group of viruses that infect and kill bacteria, and their use as antibacterials was an area of intensive study from their discovery approximately 1917 until the introduction of chemical antibiotics in the 1940s. The current antimicrobial resistance (AMR) crisis has revitalized interest in phages as a means of controlling bacteria in foods, animals and in human medicine, and they possess a number of characteristics that make them attractive as antibacterials. Phages are ubiquitous and highly successful predators of bacteria, and are present in soil, fresh water, open oceans, and associated with plants and animals as a part of

their normal flora. Phages are highly specific for their bacterial targets at the species or strain level, reducing collateral damage to beneficial members of the microflora. Finally, resistance to phages is generally unlinked to AMR, and phages are able to infect and kill even highly resistant bacteria. Phages have been shown to be effective in controlling a wide variety of pathogens in various systems, including *Salmonella* in poultry and swine, pathogenic *E. coli* in cattle and sheep, and *Listeria monocytogenes* in foods. A limited number of phage-based products targeting these pathogens are available for food safety applications. One of the reasons phage technology was abandoned in the 1940s was a generally poor understanding of what phages were and how they worked; modern research efforts are increasingly addressing basic aspects of phage biology to maintain and increase the efficacy of these promising antibacterial agents.

Key words: phage biology; antibacterial agents; antimicrobial resistance; AMR

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SYMPOSIUM ABSTRACTS: BILL E. KUNKLE INTERDISCIPLINARY BEEF SYMPOSIUM

119 Assessing the current mineral supplementation needs in pasture-based beef operations in the Southeastern United States.

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Macro and micro minerals are required for all physiological processes in beef cattle. When mineral deficiencies occur in pasture-based production systems a multitude of deficiency symptoms will occur and most often these deficiencies result in reduced production potential, reduced immunity and/or reproductive failure. More severe deficiencies will result in more specific deficiency symptoms depending on the specific mineral deficiency. In pasture-based beef operations, forage mineral supply is highly variable and dependent on the forage type, stage of forage growth, and soil fertility. Additionally, grazing cattle mineral requirements change throughout the production cycle. With the variability of forage mineral supply and the changing mineral requirements, care must be taken when developing mineral supplementation programs for grazing cattle. The macro minerals function in nerve transmission, bone development, metabolism and as electrolytes. These are Ca, P, Mg, Na, K, Cl and S. The micro minerals function in various areas of metabolism, immune responsiveness, reproductive efficiency and many other functions. These minerals are Zn, Cu, Fe, I, Mn, Se, Mo and Co. Of these minerals, those that are important for supplementation to pasture-based cattle include Ca, P, Mg, Na, Cl, Zn, Cu, I, Mn and Co. However, the amounts to be supplemented will depend on the specific mineral requirements and the forage supply of the minerals. Consequently, the development of free choice mineral supplementation programs is a moving target. Generally, this entangled mess is sorted by taking one mineral at a time into considerations. However, in doing so, one has to be cognizant of the many interactions that occur when changing intake of just one mineral in the supplement with respect to the amount supplied in the base forage. Often times, mineral nutrition problems of one or more minerals are created when trying to correct a deficiency of another mineral. This paper will address the specific mineral-mineral interactions that are important to consider when developing and delivering mineral supplementation programs in pasture-based production systems.

Key words: minerals, supplementation, pasture-based, beef cattle

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120 Mineral nutrition of forage-fed beef cattle—Impacts on reproduction.

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The importance of mineral nutrition on the reproductive function of beef cows has been a topic of investigation for many years. As levels of production increase and management systems evolve, so do the requirements of nutritionally essential minerals. For example, increased emphasis on rearing heifers to conceive as yearlings has brought attention to the importance of P nutrition in developing diets. For micro-minerals, the increased utilization of high-S supplements, such as distillers grains, have impacted Cu and Se nutrition of cattle. In addition, advancing technologies have introduced new mineral sources, such as organic and hydroxy trace minerals, and also new forms of supplementation, such as boluses and injectable trace minerals. Each of these impacts and technical advances present opportunities to improve the reproductive performance of cowherds. Among the essential macro-minerals, P is the most commonly deficient among forage-fed beef cows. A large focus on P nutrition of the cow/calf herd in the 70's and 80's has resulted in formulation of high-P supplements. Currently, pressures related to elevated cost and environmental impacts have caused scientists to rethink and refine the P nutrition of beef cattle. Among essential micro-minerals, Cu and Se are the most commonly deficient and each have been linked to reproductive function in beef cattle. The direct role of Se on reproduction is likely a secondary response to reduced immune competence due to suppressed antioxidant capacity as a result of impaired activity of the Se-dependent enzyme, glutathione peroxidase. Studies linking Cu to reproduction in cattle have been highly

variable. Evidence is emerging which suggests that Mo, a well-known Cu antagonist, is directly impacting reproductive processes independent of Cu. This symposium presentation will focus on the impacts of P, Cu, and Se on reproduction in cattle with emphasis on important antagonists (S and Mo) and new technologies influencing supplementation management.

Key words: Minerals, Cattle, Phosphorus, Selenium, Copper

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121 Impact of mineral and vitamin status on beef cattle immune function and health.

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The importance of optimal mineral and vitamin nutrition on improving immune function and health has been recognized in the preceding decades. In the southeast, beef cattle are raised on forages that may be limiting in these nutrients, especially some trace minerals (particularly Cu, Zn, and Se), for optimizing health. Dietary mineral concentrations often considered adequate for maximum growth, reproductive performance, or optimal immune function have been found to be insufficient at times of physiological stresses (weaning, transport, comingling, etc.). Clinical deficiencies of these nutrients produce classic symptoms that are common to several nutrient deficiencies (slow growth and unthrifty appearance), however subclinical deficiencies are more widespread and more difficult to detect; yet may result in broader economic losses. The impacts of these deficiencies on beef cattle health may not be apparent until the herd has been stressed in some way or calves have been weaned and potentially transported out of the region. Health problems that are caused or exacerbated by mineral and/or vitamin deficiencies include: bovine respiratory disease, footrot, retained placenta, metritis, and mastitis. Research indicates that trace minerals (including Zn, Cu, Se, Cr, and Co), and vitamins or vitamin precursors, such as vitamin E and carotenoids, impact immunocompetence. Many micronutrients have antioxidant properties through being components of enzymes and proteins that benefit animal health. In dairy cattle, high levels of supplemental Zn are generally associated with reduced somatic cell counts and improved foot health, possibly reflecting the importance of Zn in maintaining effective epithelial barriers. Neutrophils isolated from ruminants deficient in Cu or Se have reduced ability to kill ingested bacteria in vitro. Supplemental vitamin E, in its role as an intracellular antioxidant has been shown to decrease morbidity in stressed calves. There is more understanding of the biological role that these nutrients play in the functioning of the complex and multifaceted immune system. However, there is still much to be learned about determining the mineral status of herds (and hence when supplementation will be beneficial), requirements for different genetic and environmental conditions, understanding the bioavailability of these nutrients from feedstuffs and forages, quantifying the bioavailability of different supplemental sources of these nutrients, and identifying the impact of dietary antagonists on these nutrients.

Key words: beef cattle, minerals, vitamins

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122 Assessing the influence of vitamin and mineral nutrition on carcass characteristics and meat quality.

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The impact of vitamin and mineral nutrition on beef carcass quality has received variable attention in the peer reviewed literature. Most work on the topic appears with reference to fat soluble vitamins. Serum vitamin A appears to be weakly correlated to marbling score; high concentrations of vitamin A may inhibit adipogenic differentiation. A diet rich in vitamin A will also impact fat color; an orange/yellow fat color dominates during β carotene deposition in fat stores. Supplemental vitamin D appears to increase endogenous calcium levels and thus improve tenderness via enhanced activity of μ-calpain. Enhanced dietary vitamin D may also improve retail color stability. A plethora of research indicates that supplemental vitamin E scavenges free radicals thus reducing peroxidation of polyunsaturated fatty acids leading to longer retail color life. Vitamin K levels appear to be variable between breeds and muscles but supplemental K does not appear to be in the literature in reference to beef quality.

Vitamin C injected intravenously immediately antemortem (or postmortem via vascular infusion) has illustrated variable effects on retail color life. Moreover, supplemental C has received mixed results (increased marbling score, subcutaneous fat deposition, vitamin E, calcium, and iron; decreased L*) for cattle on a high sulfur diet. Supplemental B does not appear to be in the literature in reference to beef quality and should not be needed with proper rumen function.

Minimal peer-reviewed literature has investigated the association of mineral status in-life and subsequent beef quality. Supplemental calcium antemortem does not appear to affect tenderness or maturity however supplemental calcium postmortem activates the calpain enzyme system and improves myofibrillar tenderness. Supplemental phosphorus antemortem does not appear to affect tenderness or maturity. Supplemental potassium as a pre-slaughter electrolyte may positively influence carcass yield. Excess sulfur may depress LM area, marbling, subcutaneous fat, yield grade, and hot carcass weight.

Supplemental copper may reduce subcutaneous fat and increase polyunsaturated lipid content within muscles. Supplemental selenium appears to increase blood and tissue selenium but does not appear to improve retail shelf life outcomes. Supplemental zinc may increase subcutaneous and internal fat depots; zinc source also appears to influence fat deposition. Supplemental chromium may increase LM area and decrease dressed carcass yield and yield grade.

Supplemental Na, Cl, Mg, Co, I, Fe, and Mn does not appear to be in the literature in reference to beef quality.

Key words: vitamin, mineral, beef carcass

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SYMPOSIUM ABSTRACTS: COW-CALF PRODUCTION IN THE SOUTHEASTERN US: POTENTIAL FOR IMPACT AND ECONOMIC SUSTAINABILITY

123 Economic Issues for Southeast Cow-Calf Production.

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The Southeast has produced as much as 46.5% of the nation's beef cows in the past. Changing land use in the South, drought, age of producers, and competing land uses have reduced the number of beef cows in the South. But, drought and changing land use in other parts of the country, and sustainability interests have provided some opportunities for cow-calf production in the Southeast. Renewed interest in grazing systems has highlighted the importance of economic performance of these alternatives. New applied research on other cow-calf production systems may increase the productivity of the Southern cow-calf industry. This work examines changes in economic performance and future economic issues for cow-calf producers in the Southeast.

Key words: economics, beef, cattle

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124 An overview of cow-calf production in the southeast: forage systems, cow numbers, and calf marketing strategies.

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Characterization of cattle numbers and forage resources in the southeast are necessary to help evaluate research and extension needs and provide insight into the current and future potential economic status of this diverse and highly productive region. For the purposes of this presentation the southeast will be defined by the 12 states that are members of the American Society of Animal Science Southern Section. In order of greatest to least number of beef cows that have calved these states include: Texas, Oklahoma, Kentucky, Florida, Tennessee, Arkansas, Alabama, Georgia, Mississippi, Louisiana, North Carolina, and South Carolina. According to the January 1, 2015, USDA inventory report there are approximately 14,392.0 million beef cows in the southeast. This would represent 48.5% of the total 29,693.1 beef cows that have calved in the US. For comparison 50.9%, 49.1%, 52.1%, and 50.2% of the beef cows were located in the southeast in 1995, 2000, 2005, and 2010, respectively. Generally speaking at these 5-yr intervals most states have increased or decreased over time depending on weather and other local conditions. However, it is important to note that 3 states (Georgia, Mississippi, and South Carolina) have shown a steady decrease in cow numbers at each 5-yr interval. The majority of cattle operations in the southeast are cow-calf producers and their production and calf marketing strategies (e.g., age at weaning, calf size, and target market) vary tremendously. Stocker operations represent an important and fluid enterprise in the southeast that varies in size and scope depending on market conditions and geography. According to the most recent report from the USDA Economic Research Service on major land uses in the US there are approximately 144,777 million acres of grassland pasture and range in the 12 southern states; this represents 23.6% of the total 612,257 million acres in the US. While there is large amount of rangeland located in the western portions of Texas and Oklahoma, the majority of cow-calf operations in the southeast are based on introduced perennial forages. Primary perennial forages would include bermudagrass and bahiagrass in the south with fescue becoming more present moving north from the gulf coast. Additionally, over seeded winter annual forages, especially ryegrass, are commonly used by both cow-calf and stocker operators in the region.

Key words: southeast, cattle, forages

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125 Issues affecting Research and Extension Programs on cow-calf production in the SE region.

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As funding for Land-Grant Universities has increasingly turned from Federal sources to state budgets, support for cow-calf and stocker production research and extension programs has been in constant decline. Beef production is primarily dependent on forages and grazing and the southeast region is rich in forage resources. As of 2015 the Southeast supports nearly 50% of the beef cows in the US. This reflects the importance of this segment of the beef cattle industry; however, there have been different factors negatively impacting the development of research and outreach activities. There was an average of 2.8 FTE involved in ***forage-related fields*** in each of the 14 southern Land-Grant universities in 2008, which is down from an average of 7.2 FTE in 1984. Increasingly, the lack of budgetary and industry support of ***grazing research*** has reduced the publication rate and quality of science in this field. The objective of this paper is to identify these factors and increase the knowledge of the limitations that extension and research personnel confront. A survey was prepared and submitted to all Faculty from land-grant universities and USDA-ARS personnel in the southeast region of the United States (Florida, Georgia, North Carolina, South Carolina, Kentucky, Tennessee, Virginia, Texas, Oklahoma, Arkansas, Louisiana, Mississippi, and Alabama) that have research and/or extension appointment linked to cow-calf and/or stocker production. Questions in the survey relate to availability of resources (land, animals, and personnel), objectives for the programs, degree of adoption of different practices or technologies, support (state, federal, commodity, etc.), limitations for program development, future objectives, among others. This document may serve as a framework of discussion for improvement of the present situation which would allow finding solutions to limitations in research and/or extension programs in the southeast region.

Key words: cow-calf, extension programs, research programs, stockers

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SYMPOSIUM ABSTRACTS: MANAGEMENT STRATEGIES FOR INTENSIVE, SUSTAINABLE COW-CALF PRODUCTION SYSTEMS IN THE SOUTHEASTERN US (EXTENSION)

126 Early weaning beef calves from first-calf Bos indicus-influenced cows.

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Early calf weaning (EW) has been practiced during instances of environmental strain, usually witnessed by a shortage of forage. However, the use of EW as a routine annual management practice is less common. In the southeastern US, many beef cowherds utilize a percentage of *Bos indicus* lineage. Compared to traditional English lineage, *Bos indicus* females have been shown to have delayed onset of puberty and lengthened age of maturity. Improved selection for fertility and heifer development programs have improved attainment of pregnancy among yearling *Bos indicus*-influenced heifers, thus shifting the production burden toward achieving the second pregnancy as a lactating 2-yr old cow. The use of EW at the start of the breeding season, when calves are 70 to 90 d of age, results in reduced date of conception and overall pregnancy rates among these cows. In the post-partum anestrous cow, EW creates a physiological response which elicits cyclicity, even in cows with marginal body condition (i.e., calf withdrawal response). Additionally, EW results in approximately 25% less voluntary DMI. Although 2-yr old lactating cows can often be successfully rebred when enrolled in adequate post-calving nutritional programs, EW allows for these cows to become pregnant sooner in the breeding season with less nutritional resources. As 3-yr olds, these cows calve earlier the next season allowing more time to become rebred with their third calf. Following EW, producers have multiple options for calf rearing, including immediate marketing or developing the calves on pastures and/or feedlot. Much of our research over the past 15 yr has focused on management of EW calves, which reveal exceptional gain:feed and reduced stress associated with pathogen challenge, transport, and feedlot entry. During the first 90 d following EW, calves require concentrate feed sources (20% CP and 78% TDN) offered at 1 and 2% BW daily when grazing winter annuals or perennial pastures, respectively. Economic comparison of cost of gain among differing systems are dependent on forage and feed resources available at the time of EW, which are influenced by season and region. Collectively, early attainment of pregnancy among post-partum, anestrous cows, coupled with the high-performance potential of EW calves makes this management practice a cost-effective system for *Bos indicus*-influenced cowherds.

Key words: Early weaning, Calves, *Bos indicus*, Reproduction

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127 Potential for more intensive Cow-Calf production in the Southeast Region.

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Cow-calf production within the Southeastern U.S. includes small to medium systems that incorporate low levels of management inputs. Implementing more intensive management across the region has been difficult to achieve due to environmental, economic and social pressures. Toxic tall fescue is part of the problem in that it is tolerant to overgrazing and is well suited to a heavy hay feeding system. There is great potential for improved forage yield and utilization efficiency through better fertility and grazing management, and by the introduction of complimentary alternative forages. One positive attribute of tall fescue is it's potential as stockpiled forage for winter grazing. Intensive winter strip-grazing is a practice that takes relatively little grazing management expertise and fence infrastructure so it is a good practice to get producers started with more intensive grazing. Winter strip-grazing can result in high forage utilization efficiency, and while cow-calf and yearling gains may be restricted, increased animal carrying capacity with comparable breeding rate appears to favor intensive utilization. However, problems with fescue toxicosis are common, and management systems that mitigate this problem will be important to future improvement of fescue-based systems. The toxins present in endophyte-infected tall fescue have a myriad of effects, with many of the more severe problems related to constriction of blood vessels and reduced blood flow in most tissues studied. Strategies to manage fescue toxicosis include both animal focused and agronomic solutions. Each have potential, but a combination of the two approaches will likely be needed. Non-toxic endophyte infected fescue is being gradually adopted with varying success, but many areas are not well suited to renovation. It has been long known that using heat tolerant cattle such as Bos Indicus breeds or Senepol imparts some tolerance to fescue, but because of market forces, using these breeds is not well accepted in much of the fescue region. Recently the discovery of the "slick hair gene" in Senepol and other tropical breeds allows the potential for inserting this trait into cattle with highly desirable growth and meat quality. Many farmers in the Mid-Atlantic region are interested in local finishing systems for beef. High prices for local beef and a resurgence of small processors areas have stimulated these production systems. Finishing a significant portion of calves requires major structural changes to the farm system to improve post-weaning performance and to balance forage availability.

Key words: Fescue Toxicosis, Stockpiled Fescue, Local Beef

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SYMPOSIUM ABSTRACTS: MANAGEMENT STRATEGIES FOR INTENSIVE, SUSTAINABLE COW-CALF PRODUCTION SYSTEMS IN THE SOUTHEASTERN US (RUMINANT ANIMAL PRODUCTION)

128 Bermudagrass Pastures Overseeded with Cool-Season Annual Grasses and Clovers.

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From the eastern half of Texas and throughout most of the Gulf States below Interstate 20, warm-season perennial grasses (WSPG) such as bermudagrasses (*Cynodon dactylon*) and bahiagrass (*Paspalum notatum*) are the basic pasture unit for all grazing livestock. Sustainability of pastures are affected by management choices for variety of WSPG; level of fertilization-lime and especially nitrogen; winter-annual small grain, ryegrass, and/or clover; stocking rate; stocking method; and degree of forage utilization. Management strategies for cow-calf production includes selective choices for breedtype of cow and bull; terminal sire or replacement females; calving season(s); weaning weight objectives; and retained ownership options. Management strategies for forage-animal production efficiencies includes gain per animal; gain per unit land area; ecosystem sustainability; and economic objectives with awareness of risk-aversion for pasture systems. Forage mass of N-fertilized Coastal bermudagrass pastures, for example, can accommodate 9 cow-calf pair/ha (680 kg BW = 1 pair) during the active growing season. However, these stocking rates will result in lactating cow ADG of 0–0.90 kg/da and suckling calf ADG of about 0.60 kg/da. Reduced stocking rate of about 5 pair/ha can produce similar calf gain/ha of about 750 kg/ha as high stocking rates but without the extreme weight loss for cows. Long-term continuous high stocking rates on bermudagrass pastures can result in loss of stand and increased ecotype diversity. The degree of stocking intensity should include flexible forage utilization regimens to prevent destruction of the pasture unit. Management strategies for intensive cow-calf production must combine awareness-sensitivity to seasonality of forage production, stand-maintenance of pastures, and use of hay and/or supplementation to buffer forage deficiencies or level of total animal gain per unit land area. Overseeding bermudagrass with cool-season annual forages allows for decisions for calving season and retained ownership of weaned calves to optimize sale weights.

Key words: bermudagrass, overseed, pastures

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129 Matching forage systems with cow size and environment for Sustainable Cow-Calf production in the southern region.

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There has been increased interest in intensification of cow-calf production due to an increasing world population and red meat demand along with reductions in available grazing lands. Intensified production can come about by increasing fertilization, supplementation, or feeding of stored forages, but the sustainability of total reliance on these management applications is questionable. Forage management strategies, which include targeted fertilization, stockpiling, and complementary forages can be incorporated with improved grazing management to reduce reliance on often expensive supplemental feed, fertilizer, and fuel inputs to the enterprise. Stockpiled warm-season grasses have been shown to provide forage during the fall and early winter, but significant losses in nutrient availability over time limits their use to a 60-d window between mid-October and mid-December. Incorporation of complementary cool-season forages into the production system both extends the grazing season and provides high-quality forage to replace hay or dormant warm-season grasses, but maintaining cool-season perennials can be difficult and replanting annuals is expensive. Intensification of grazing management through rotational grazing improves harvest efficiency by grazing livestock and can improve persistence of difficult to maintain forages in the grazing system. Over the last 40 yr, mature cow size has increased by over 30% and increased the ME requirements of the cows reducing pasture carrying capacity and increasing other input costs associated with cow maintenance. Further, increasing mature cow size decreases production efficiency of the cowherd. Research from the 1960s and 1970s indicates that in limited resource environments (western part of the Southern Plains) the reduced efficiency of large cows may be a limiting factor to economics of production, while in higher rainfall environments (western Gulf Coastal Plains) mature cow size may not be a significantly limiting factor. Integration of multiple management technologies (rotational grazing, stockpiling both cool- and warm-season perennials, and planting cool-season annuals) into a production system has been shown to enable increased stocking rates and calf BW weaned per hectare, while also decreasing the requirement for conserved forages. By intensifying the management of cowherds and pastures, ranch carrying capacity can be increased and thereby increase available stocking rates, offset the effects of increased cow mature size, increase total system productivity, and provide for an economically sustainable cow calf production system.

Key words: Forage, Cow-calf, southern region

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TEACHING AND UNDERGRADUATE EDUCATION

130 The use of a mobile app in teaching beef cattle body condition scoring in undergraduate classes.

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There are several mobile apps that are currently available to help producers correctly assign a body condition score (BCS) to beef cows. However, there have been no studies looking at integrating these apps into undergraduate classes. To investigate this, an undergraduate, junior–level, applied nutrition class of 66 female and 12 male students was utilized to complete this study. All experimental procedures were approved by Clemson University IACUC and IBR. During class, before students were taught about BCS in beef cows, a general pretest was administered. The pretest consisted of two questions that were designed to assess the students' basic understanding of BCS in beef cattle. After administration of the pretest, all students were taught the same in-class material that reinforced the concepts of BCS in beef cattle and were shown multiple examples of cattle with different BCS. The students were then randomly assigned to either control (without use of the app) or treatment (use of the Crystalyx BCS app; APP) with pretest score and gender used as blocking factors. Students were subsequently asked to assign BCS to 20 cows during lab that ranged from a BCS of 3 to 7.5. Student performance (points missed) was analyzed using the GLM procedure of SAS with treatment, pretest grade, gender and treatment * pretest grade in the model. Students with access to the app correctly assigned BCS more frequently than students without the app (P = 0.0041, 68% correct APP vs. 60% correct Control). Male students were more likely (P = 0.04) to incorrectly assign BCS compared to female students (60% vs. 67% respectively). There was a tendency (P = 0.065) for a treatment * pretest interaction with students using the App who scored either a 0 or a 2 (either missed all points or received all points) on the pretest scoring better (70% and 74% correct respectively) than their colleagues who scored the same on the pretest in the control group (59% and 56% correct respectively). These results indicate that using a BCS app in undergraduate classes could help students learn to more accurately assign BCS to beef cattle.

Key words: Undergraduate teaching, Beef cattle BCS, Technology

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Table 131. Student response regarding the benefits of participating in the agriculture industry travel course (n = 9).

Participating students' perceptions for the following questions	Response rated to yes	Average
My understanding of the agricultural industry was expanded	9/9	100
Increased my understanding various elements of Agricultural industry	9/9	100
The tour provided me new revelations about skills and needs of the agriculture industry	9/9	100
Increased my knowledge of potential internship and career opportunities in the agriculture industry	8.5/9	94.4

131 Experiential Learning for Tuskegee University Students: Study Tour of Agricultural Industries.

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In an effort to increase awareness about career opportunities in the agricultural industry, Tuskegee University (TU) recently implemented a new course, Study Tour of Agricultural Industries to enhance students' knowledge of agriculture industries, provide exposure to internship and career opportunities, and learn about the skills and preparations needed to pursue said careers. Two faculty members, one staff and ten students from the College of Agriculture, Environment and Nutrition Sciences at TU visited National Future Farmers of America, Dow AgroSciences, Elanco Animal Health in IN; a Cargill facility in IL; Royal Canin Pet Health and Nutrition Center in OH and Pig Improvement Company in TN. Here the effectiveness of the week-long study tour was assessed. Data were gathered using a questionnaire and analyzed by descriptive statistics. Eight of 10 students (6 females and 4 males) had their career goals to be future veterinarians while 2 were with agribusiness majors. Nine of the 10 participants responded to the survey. Results showed that the tour met the participants' expectations (100%), and that the tour was well planned (100%); however, 78% indicated that the transportation could have been better. The majority (89%) of students preferred to have this trip during the spring, and 67% of students indicated that the trip could have been enhanced by the addition of entertainment activities and student input regarding the selection of agriculture industries. Further, 78% of the respondents were willing to pay up to $100-$300 for the trip, but 22% were unwilling to pay. All respondents indicated that they would recommend the course to others. Overall, the respondents' perception of the benefits of the study tour was favorable as shown in Table 131.

The results clearly demonstrate that students acquired valuable perspectives and knowledge about the agriculture industries and associated careers, and it is recommended that the agriculture industry travel course be continued as a part of the agriculture curriculum.

Key words: undergraduate students, agriculture industry travel, experiential learning

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132 Equine Assisted And Affiliated Therapies Provide Service-Learning Opportunities For Students.

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Service–Learning has received favorable acceptance in the academic community for providing a multifaceted collaborative educational format that addresses human and community needs by having students engaged in structured service activities with opportunities for reflection promoting both learning and student development. Many universities offer either formal training in Equine Assisted and Affiliated Therapies (EAAT) or have partnerships with EAAT programs to permit student volunteers to participate with therapy sessions. Typically, EAAT require a significant volunteer component to effectively and economically provide services to their clients. These programs are well-suited for incorporation into an academic program to fulfill the Service-Learning component. As part of a Service-Learning Faculty Fellows incentive at Texas A&M University, students were recruited to participate in a course with the following objectives. Their 'service' was in participating in therapy sessions at one of two EAAT programs where they were trained by PATH Intl. certified instructors as side-walkers or horse handlers and had the opportunity to learn behind-the-scenes issues facing these beneficial programs. In addition to assisting with therapy sessions, students attended seminars on EAAT, toured a fully functional EAAT facility that is also involved in research on the benefits of this therapy, and at the end of the course, prepared a reflective document based on guidelines designed to motivated them to explore the impact of their service beyond the 'feel-good' aspect of volunteerism. After five semesters, this Service-Learning course in the TAMU Animal Science Department has been used by more than 100 students. Although most students stated that their participation in EAAT programs would continue to be as a volunteer, slightly less than 10% indicated that their careers would include EAAT either as an owner, director, instructor or therapist. In their reflections, greater than 90% indicated the desire to continue an association with EAAT. All students wrote that participation in the Service-Learning course had contributed to their college experience by providing a structured hands-on learning experience where participation made a difference to society (paraphrased). The objective of utilizing EAAT as a vehicle to promote and establish service-learning in the Animal Science curriculum was fulfilled. The objective of providing a beneficial service to those in need within the community was accomplished (and continues). With the expansion of EAAT programs nationwide, there is ample opportunity for university collaboration to develop Service-Learning opportunities for students who want experience without significant financial commitment for faculty or facilities.

Key words: Service-Learning, reflections

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133 Student Performance in Animal Nutrition and Feeds and Feeding Based on Prior Enrollment in Chemistry and Nutrition Courses.

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Many undergraduate Animal Science curricula include two nutrition courses: Animal Nutrition and Feeds and Feeding. Some curricula indicate Animal Nutrition as a prerequisite for Feeds and Feeding. Additionally, both courses generally include prerequisites of general and(or) organic chemistry. At Texas A&M University-Commerce a great number of non-Animal Science students have expressed interest in one or both of these courses. This has resulted in a subset of students who have received permission to enroll in one or both courses without completing the recommended prerequisites. The objective of this study was to determine if final grades in these courses were impacted by students' prior enrollment in general chemistry, organic chemistry, and the other nutrition course (Animal Nutrition for Feeds students, and Feeds for Animal Nutrition students). Final grades (scale of 0 to 100%) were analyzed for students enrolled in three offerings of Animal Nutrition (Fall of 2012, 2013, and 2014; $n = 60$) and three offerings of Feeds and Feeding (Spring of 2013, 2014, and 2015; $n = 74$). Students were categorized (Yes/No/Concurrent) as having previously taken the following three courses: general chemistry, organic chemistry, and the other nutrition course. Data were analyzed using the MIXED procedure of SAS. The percentage of Animal Nutrition students with previous or concurrent enrollment in general chemistry, organic chemistry, and Feeds and Feeding was 82%, 53%, and 20%, respectively. Prior or concurrent enrollment in general chemistry did not affect ($P = 0.88$) final Animal Nutrition grades. However, final Animal Nutrition grades were 4.4% units greater ($P = 0.03$) for students with prior or concurrent enrollment in organic chemistry. Prior enrollment in Feeds and Feeding did not impact ($P = 0.85$) final Animal Nutrition grades. The percentage of Feeds and Feeding students with previous or concurrent enrollment in general chemistry, organic chemistry, and Animal Nutrition was 95%, 46%, and 47%, respectively. Final Feeds and Feeding grades were not affected ($P \geq 0.14$) by prior or concurrent enrollment in general chemistry, organic chemistry, or Animal Nutrition. For both courses, very few students had no background in general chemistry, which likely contributed to the lack of significant difference in final grades for these students. Results indicate student performance in Animal Nutrition is improved if students have prior exposure to organic chemistry. However, based on these results for these particular courses, Animal Nutrition is not justified as a prerequisite for Feeds and Feeding.

Key words: nutrition, prerequisites, undergraduate

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UNDERGRADUATE STUDENT COMPETITION

134 The Influence of a Rider with a Disability on the Equine Walk.

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Scientific research regarding the influence of a rider with a disability, as seen in hippotherapy or equine assisted activities, on the equine walk has been limited. Changes in the horse's walk could have impacts on the soundness and long-term usability of the horse for this use. The purpose of this pilot study was to determine if horses carrying a rider with a disability would exhibit a different walk pattern than when carrying a rider without a disability. The kinematic variables measured were: stride length, stance width, swing duration of each hoof, and stance duration of each hoof. Four stock-type geldings were used, each subjected to four riding treatments: one rider with a disability, two separate riders without a disability and a no rider treatment (negative control). For all mounted treatments, horses were filmed with and without a horse handler. All riders were matched according to sex, height, weight, and riding experience. All horses were accustomed to use in a therapeutic riding program. Reflective markers were placed on the proximal aspect of the lateral hoof wall on both right hooves and the proximal aspect of the dorsal hoof wall on both front hooves on each horse to aid in analyzing the film. Horses were walked through the capture space with cameras positioned in front of and on the right side of the horse. Film footage was analyzed using Dartfish. Data were analyzed using a repeated measures General Linear Model in SPSS v.22. Individual treatment means were evaluated using LSD Means. Significance was set at $P < 0.05$. For all horses when led by a handler, there were no differences in stride length, stance width, and stance duration. There was a difference in swing duration between one of the riders without a disability and the negative control, but no other differences among treatments. When horses were not led by a handler, there were trends ($P < 0.10$) toward differences by rider treatment for stride length, stance width, and stance duration, but no differences in swing duration. Within individual horses, there were significant differences between rider treatments in some, but not all of the variables of interest. The low number of observations in this study and mixed results warrants further research into this subject. In the future, using a larger sample size would be recommended.

Key words: equine assisted activities, gait analysis, kinematic variables

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135 The Effect of Submaximal Exercise on Proliferation of Satellite Cells from Yearling Equids.

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Skeletal muscle satellite cells (SCs) become mitotically active, proliferate and differentiate to increase muscle size. The objective of the study was to measure the impact of submaximal exercise on horse SC proliferation, as well as the effect of time in culture on proliferation rates. Unfit, female Quarter Horse yearlings (n = 4) maintained on tall fescue pasture were exercised in a round pen for 5 min at a minimum heart rate of 135 beats per minute. Middle gluteal muscle samples were retrieved aseptically via vacuum-assisted biopsy at 24 h pre-exercise, and 24 h, 48 h, 72 h, and 96 h post-exercise. Satellite cells were isolated by pronase E digestion and differential centrifugation. Purity of the SC isolates was 90% or greater as measured by Pax7 immunostaining. Fresh isolates were cultured in Dulbecco's Modified Eagle Medium containing 20% fetal bovine serum, 4 ng/mL fibroblast growth factor-2, and 250000 units penicillin and 250000 mg streptomycin (growth media; GM). During the final 2 h of culture, EdU, a thymidine analog, was included for the measurement of proliferation rates. Cells were fixed with 4% paraformaldehyde in PBS and EdU incorporation was detected by fluorescent chemistry (ClickIt EdU AlexaFluor488). Total nuclei were detected with 4',6-diamidino-2-phenylindole (DAPI). Representative epifluorescent micrographs at 200-fold magnification were captured digitally and the numbers of EdU and DAPI cells were quantified. The percentage of proliferating cells was calculated as number of cells containing EdU divided by the total number of DAPI nuclei multiplied by 100. The percent proliferation was analyzed by ANOVA in the GLM procedure of SAS. The SCs cultured for 48 h in GM showed a greater ($P < 0.0001$) percentage of proliferating cells (24.01 ± 0.8804) than those cultured in GM for 24 h (0.9670 ± 0.8804). Post-exercise proliferation rates did not differ from pre-exercise values at either 24 h ($P > 0.9999$) or 48 h ($P > 0.2827$) of culture. These results demonstrate that muscle SCs isolated from young horses activate and commence proliferation between 24 and 48 h in culture. The submaximal exercise treatment did not affect activation kinetics as indicated by no change in the time to proliferate. The intensity of exercise required to stimulate SC activation in young horses remains unresolved.

Key words: satellite cells, proliferation, exercise

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136 How frequency of supplementation containing rumen protected fat affects serum fatty acid profiles in beef heifers.

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Studies have shown that daily supplementation of rumen protected fats (RPF) is optimal for lactating dairy cows; however, the optimal frequency of supplementation for growing beef animals in unknown. The study's purpose was to determine if supplementation frequency of RPF (Megalac-R) influences BW, BCS, and circulating serum fatty acids (FA) in growing heifers. Twelve early gestation beef heifers (~60 d of gestation) were supplemented 0.5 kg corn gluten feed daily with access to grazing and hay during a 3-wk adaptation period (AD). During the last 3 d of the adaptation period, blood samples were collected immediately before supplementation, then 8 and 16 h post-supplementation. Subsequently, each heifer was randomly assigned to one of 3 supplementation frequency treatments of RPF for 3 wk in a Latin square design with 3 periods: 3 d/wk (3D), 5 d/wk (5D), or 7 d/wk (7D), with each treatment receiving the same amount of RPF and corn gluten feed per wk. Blood samples were collected during the final 3 d of the supplementation period as in the adaptation period. Serum FA profiles were analyzed on a random subsample of 8 heifers. Heifer BW and BCS changes, along with serum FA profiles, were analyzed using the MIXED procedure of SAS. Heifer BW and BCS changes during the 3 wk period were similar ($P > 0.39$) between treatments (9, 13, and 10 kg SEM 3 kg; 0, 0, and −0.1 BCS units SEM 0.1; 3D, 5D and 7D respectively). Serum concentrations of 18:2 were increased during supplementation compared to the adaptation period (trt*day*time effect $P = 0.04$). However, there was no difference between supplementation frequencies within a day*time period. Total serum FA concentrations had a trt*day*time interaction ($P = 0.01$). Heifers supplemented with RPF had increased serum FA compared to when non-supplemented. There were also decreases in serum FA between the supplementation frequencies over the course of the 3-d sampling period. These results demonstrate that supplementation of RPF during early gestation improves serum FA profiles of beef heifers, specifically increasing concentrations of both 18:2 and total serum FA. However, these improvements do not appear to be dependent on the frequency of RPF supplementation.

Key words: Serum fatty acids, Rumen protected fat, Supplementation frequency

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137 The effects of early or mid-gestation nutrient restriction on bovine fetal pancreatic development.

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Information on the effects of nutrient restriction (NR) in beef cows on fetal pancreatic development is limited. To address this, primiparous Angus-cross cows were fed either control (1.3 X) or NR (.55 X) diets based on NE_m and CP requirements (NRC 2000). Treatment breakdown was as follows: (n = 8) control (Con) d30–190 (n = 7); NR d30–110, Con d110–190 (n = 7); and Con d30–110 then, NR d110–190 of gestation. Cows were harvested on d190 of gestation and fetal weights and tissue samples were collected. Pancreas samples were embedded in paraffin and sectioned. Standard immunohistochemistry procedures were used to quantify insulin positive β-cells and their apoptosis rate using TUNEL staining. Data were analyzed via ANOVA analysis using the GLM procedure of SAS. Control and Con/NR cows gained weight during d30–114 and maintained BCS (12 ± 5 and 13 ± 5 kg; 0.1 ± 0.2 and 0 ± 0.2 BCS respectively) while NR/Con cows lost ($P < 0.001$) 50 ± 5 kg and 1.1 ± 0.2 BCS units. From d114–190, Con and NR/Con cows gained weight and maintained BCS (14 ± 5 and 19 ± 5 kg and 0 ± 1 and 0.3 ± 2 BCS respectively) while Con/NR cows lost ($P < 0.0001$) 77 ± 5 kg and 1.3 ± 0.2 BCS units. At harvest, fetal weights tended to be greater ($P = 0.08$) in the Con group and similar between Con/NR and NR/Con groups (10.3 ± 0.4, 8.9 ± 0.5, and 9.1 ± 0.5 kg respectively). Fetal empty carcass weights were reduced ($P = 0.03$) in Con/NR and NR/Con compared to Con fetuses (7.2 ± 0.4, 7.2 ± 0.4 and 8.5 ± 0.4 kg, respectively). Pancreas weights were greater ($P = 0.03$) in Con fetuses and lowest in Con/NR with NR/Con fetuses intermediate (6.3 ± 0.4, 4.5 ± 0.4, and 5.6 ± 0.4, respectively. β-cell mass was greatest ($P = 0.009$) in Con fetuses compared to Con/NR and NR/Con fetuses (689 ± 51, 441 ± 54 and 553 ± 54 β-cells per field; respectively). Percentage of TUNEL positive β-cells were increased ($P < 0.001$) in Con/NR and NR/Con fetuses than Con fetuses (22.4 ± 1.0%, 17.7 ± 1.0%, and 14.5 ± 1.0% respectively). This suggests that nutrient restriction either during early or mid-gestation can negatively impact fetal pancreatic development.

Key words: fetal pancreas, β cells, nutrient restriction

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138 Effect of processing on the palatability of Pongamia seedcake in cattle.

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We evaluated the impact of oil extraction method and fungal treatment on palatability of Pongamia seedcake (PSC). Periods were 4 d with 3 d of supplement testing and 1 d washout. Supplements (500 g) were offered for 10 min, orts were weighed and the supplement was returned until the steer lost interest. In project 1, seven steers (355 kg BW) were used in a 7 × 7 Latin square to evaluate expeller pressed (EKC) or solvent extracted (SKC) PSC, included at 0, 20, 40, and 60% of the supplement. In project 2, seven steers (301 kg BW) were used in a 6 × 6 Latin square, with an additional steer. Six treatments included 4 levels of fungal treated PSC (MC) 0, 20, 40, and 60% of the supplement and two types of untreated seedcake, EKC and SKC each included at 20%. Wheat middlings served as our base supplement. In project 1, there was a treatment × d interaction ($P < 0.01$) for consumption, driven by decreased intake of the 40% supplements across days whereas other treatments increased slightly or remained unchanged. Consumption was complete (500 g) for 0%, and linearly decreased with increasing levels of either sources of PSC ($P < 0.01$). Consumption of 60% EKC (185 g) was less than ($P < 0.01$) 60% SKC (385 g) and consumption of 40% EKC (221 g) was significantly ($P < 0.01$) lower than 40% SKC (415 g), but consumption of 20% EKC (465 g) and 20% SKC (489 g) were not different ($P = 0.53$). Ten min consumption rate of 40 and 60% levels of both EKC and SKC were significantly slower ($P < 0.01$) than the 100% WM control. In project 2, there was a linear ($P < 0.01$) decrease in consumption as MC increased ($P < 0.01$) from 439 g for 0% to 200, 182, and 57 g for 20, 40, and 60%, respectively. When compared to the consumption of the 20% SKC (320 g) consumption of 20% MC (200 g) was less ($P < 0.01$), while the 20% EKC (296 g) was intermediate. Ten min consumption rate linearly decreased ($P < 0.01$) as MC increased, from 41.3 to 4.8 g/min for 0 and 60%, respectively. Additionally, 20% MC (14.0 g/min) had a slower rate of consumption ($P < 0.04$) than either EKC (27.0 g/min) or SKC (27.6 g/min). Palatability issues in both projects were most likely associated with residual oil and karanjin concentrations in supplements offered.

Key words: Protein, Cattle, Supplementation

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139 A Role for Interleukin-6 mRNA Expression in Caprine Testes.

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Interleukin-6 (IL-6) is a cytokine secreted by macrophages as an immune response to foreign antigens during inflammation. Recent studies in mice indicate that IL-6 may also have a role in mammalian spermatogenesis; however, its exact function in this process remains unclear. Further in goats, no information is currently available regarding IL-6 in the testis. The objective of this study was to determine the mRNA expression levels of IL-6 in the caprine testis during three development stages as an initial step in elucidating a potential role for it in testicular function. To that end, Genbank and Ensembl were used to design degenerate primers for IL-6, as a caprine sequence is not available. The resultant primer pair, cIL-6 Forward 420 exon 4 (5'-CATGGAGTTGCAGAGCAGTAT-3') and cIL-6 Reverse 502 exon 5 (5'-TTGTGGCTGGAGTGGTTATTAG-3'), was generated. Total RNA was extracted from the testes of neonate (n = 10; > 30d), pre-pubertal (n = 10; ~120d), and post-pubertal (n = 10; ~180d) goats and reversed transcribed into cDNA, which was then amplified by quantitative polymerase chain reaction (qPCR) by using the SYBRGreen method. Analysis of qPCR results was performed by using the LIVAK method to determine relative expression levels. Subsequently, ANOVA and Tukey's were used to test for the mean difference of mRNA expression of IL-6 between the three stages ($p < 0.05$). IL-6 mRNA expression approached significance ($p < 0.065$) with expression in the pre-pubertal animals (0.209 ± 0.042) lower compared to the post-pubertal animals (0.562 ± 0.141); there was no significant difference between the neonates (0.395 ± 0.095) when compared to the pre-pubertal ($p < 0.2$) and post-pubertal groups ($p < 0.25$). These data support a role for IL-6 in testicular function; additional studies are needed.

Key words: Interleukin-6 caprine mRNA

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140 Evaluation of the effects of dam age on growth performance and carcass traits of crossbred steers.

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Offspring performance has been reported to be impacted by dam age; however, little current research is published evaluating its effects on carcass traits. The objective of this study was to evaluate the effects of dam age on steer calf performance and carcass characteristics. Over 3 consecutive yr, fall-calving, mixed-aged, Angus crossbred cows (n = 166) were allocated to 1 of 4 age categories consisting of: 1) 3 and under (Age3); 2) 4 to 6 yr old (Age4–6); 3) 7 to 10 yr old (Age7–10); and 4) 11 and older (Age11+). Offspring were Angus or Hereford sired. Steers were weaned in May, remained on farm unit of origin for approximately 2 mo post-weaning and grazed as an individual group, and were then transported to the West Texas A&M Research Feedlot. A standard feedlot diet was offered daily and steers were fed until harvest. Steers were finished to a similar estimated degree of finish (1.27 cm backfat) and transported to Friona, TX for harvest. Carcass measurements were evaluated post-harvest. Calf performance and carcass measurements were analyzed using PROC MIXED of SAS. To account for variation within year and sire, year and sire within treatment were considered random effects. Carcass quality grade was analyzed using PROC FREQ of SAS. Steers born to Age11+ had greater ($P < 0.01$) birth weight compared with all other dam age treatments. Weaning weights were greater ($P < 0.01$) from Age11+ and Age7–10 compared with Age3. Hot carcass weight, yield grade, back fat thickness, marbling, and KPH did not differ ($P \geq 0.23$) from steers with different aged dams. Ribeye area was larger ($P = 0.03$) from calves whose dams were Age3, Age4–6, and Age7–10 compared with calves whose dams were Age11+. Percentage of calves that graded choice or select did not differ ($P = 0.51$) between dam age groups. Based on these data, dam age may affect offspring performance in the feedlot; however, age of dam may have less effect on carcass traits when steers are finished to similar endpoints.

Key words: dam age, crossbred steer performance, carcass traits

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141 The effects of zinc supplementation on feedlot performance, carcass characteristics, and blood metabolites of finishing steers.

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The objective of our study was to observe the effects of zinc (KemTRACE® Zinc Propionate 27, Kemin Industries, Inc.; Des Moines, IA) on feedlot performance, carcass characteristics, and blood metabolites during the finishing phase of feedlot steers. Crossbred steers (n = 32; 442 ± 17 kg) were blocked by BW and organized in a completely randomized block design (8 pens; 4 pens/treatment; 4 steers/pen). Treatments included: 1) 0 g of additional zinc; control **(Con)** or 2) 1 g/hd/d of additional zinc **(Zn)** added to the steam-flaked corn based finishing diet. Ractopamine hydrochloride was added to the diet for the final 28 d of the feeding period at 300 mg/hd/d. Body weights were measured on d 0, 42, 79, 107, and 111.

Blood was collected from a subset of black-hided steers (2 steers/pen; n = 16) on d 0, 42, 79, and 107 to determine non-esterified fatty acid **(NEFA)** and serum urea nitrogen **(SUN)** concentrations. Carcass data were collected by trained personnel at a commercial abattoir. Overall BW and DMI were not affected by treatment ($P \geq 0.20$). Zinc supplementation caused an increase in ADG during the β-agonist feeding period ($P = 0.02$). Similar results were detected for feed efficiency, with Zn steers being more efficient than Con steers during the β-agonist feeding period ($P = 0.03$). Over the entire study, ADG and G:F numerically favored the Zn steers, but were not statistically different ($P \geq 0.13$). No differences were observed for any carcass parameter measured ($P \geq 0.14$). Blood metabolite analyses resulted in Zn steers displaying a greater serum NEFA concentration than Con steers ($P < 0.01$). Serum urea nitrogen was not affect by treatment ($P = 0.26$), but did increase for both treatments from d 0 to 42 ($P = 0.01$) and d 79 to 107 ($P = 0.01$). The results of this study suggest that zinc supplementation increases the performance and efficiency of finishing cattle during the β-agonist feeding period.

Key words: beef cattle, β agonist, NEFA, feedlot performance, SUN, zinc propionate

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142 Effect of Increasing Dietary Energy Consumption on Intake, Digestion, and Ruminal Fermentation in Limit-Fed Steers.

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Effects of increasing dietary energy consumption on intake, digestion, and ruminal fermentation in limit-fed cattle were determined using 16 ruminally cannulated steers (359 kg ± 44 BW). Steers were fed wheat straw (0.56% of BW) and one of four levels of concentrate (0.69, 0.88, 1.06, and 1.25% of BW) to achieve 70, 85, 100, and 115% of NRC predicted NE_m requirements in a randomized complete block design. Concentrate portion of the diet consisted of dry-rolled corn (45%), dried distillers' grains (42%) and a premix (13%). Diets and feeding levels were consistent with a companion mature cow project. The trial was 17 d, with 11 d for adaptation, 5 d to determine intake and digestion, and a 1 d ruminal fermentation profile. Dry matter intake increased linearly ($P < 0.01$) from 3.70 kg/d for 70% to 4.19, 4.66, and 5.22 for 85, 100, and 115%, respectively. Digestion of DM increased linearly ($P = 0.03$) from 64 to 74% for treatments 70 and 115%, respectively. There were no differences for NDF and ADF digestion ($P > 0.20$). Digestion of GE increased linearly from 65% to 70, 67, and 75% for treatments 70, 85, 100, and 115%, respectively ($P = 0.03$). Correspondingly, DE intake increased ($P < 0.01$) linearly from 9.6 Mcal/d for 70% to 15.6 Mcal/d for 115%. Mean ruminal pH decreased quadratically ($P < 0.01$) with increasing energy intake. Similar mean pH values were observed for 70, 85, and100%; 6.34, 6.38, and 6.36, respectively; there was a decrease to 6.25 for 115%. No time × treatment interaction was observed ($P = 0.17$) for ruminal pH. Nadir of ruminal pH was 6.15 and 5.95 at h 6 for 85 and 115%, respectively, lowest ruminal pH for 70% was 6.05 at h 9, and 100% was 6.12 at h 12. A treatment × hour interaction ($P < 0.05$) for acetate to propionate ratio resulted from changes in magnitude, not a re-ranking of treatments. Mean acetate to propionate ratios decreased quadratically ($P = 0.02$) and averaged 3.28, 3.36, 3.02, and 2.98 for treatments 70, 85, 100, and 115%, respectively. Increasing concentrate provision increased diet digestion and energy consumption without producing changes in ruminal fermentation that would negatively impact long-term ruminal health.

Key words: cattle, limit-fed, energy requirements

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143 Impact of Hydration Supplements on Blood Electrolyte Concentrations of Exercised Horses During the Summer.

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Dehydration in horses is a major concern for those involved in the equine industry, especially during the hot summer months. At these times high temperatures can induce increased sweating rates in horses, potentially causing water and electrolyte losses to reach dangerous levels. The objective of this experiment was to compare the impact of two hydration supplements on blood electrolyte concentrations of horses after exercise in the summer. Six mature horses (mean BW = 525 ± 69 kg) were group housed with ad libitum access to pasture and water, and were offered 0.91 kg of 14% CP pellet·horse-1·day-1. Horses were stratified by age, breed, and sex, and randomly allocated into 3 treatment groups in a Latin square design. Treatments included control (no dietary change), ELEC (30 g of supplemental electrolyte daily), and WH (wet hay, 0.91 kg of hay soaked in 5 L of water daily). For four mornings leading up to and including sampling days, horses were separated and offered their assigned treatment diets. A 3-d washout period between treatments resulted in 1-wk rotations for each of the three treatment offerings. On the fourth day of each week horses were ridden for approximately 30 min at the same time during the hottest part of the day. The maximum temperature on sampling days was 37°C for week 1, 37.8°C for week 2, and 37.8°C for week 3. Blood samples were obtained via jugular venipuncture immediately before and after exercise for measurement of sodium and chloride concentrations. The change in blood electrolyte concentrations of each horse was calculated before data analysis. Data were analyzed using the MIXED procedure of SAS. There was a tendency for treatment to impact change in blood chloride concentrations ($P = 0.06$) where mean change in chloride concentrations of ELEC horses was +6.13 mEq/L compared to a mean change of −3.98 mEq/L for WH horses. Treatment did not affect ($P = 0.43$) change in blood sodium concentrations. Results indicate that the ELEC treatment may help maintain blood electrolyte concentrations after 30 min

of exercise during high environmental temperatures. Horses may benefit from this supplement to help maintain adequate hydration during the summer.

Key words: electrolytes, horse, hydration

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144 Decreasing the frequency of wet brewers grains supplementation during late gestation did not impact cow and pre-weaning calf growth performance.

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This study evaluated the pre-weaning growth performance of beef calves born to cows that received or not wet brewers grains (WBG) supplementation at different frequencies during late gestation. At about 45 d before expected calving date (d 0), Angus beef cows pregnant by embryo transfer (n = 28; 590 ± 19 kg of BW; 5 ± 0.7 yr of age) were stratified by BW and age, and assigned to 1 of 14 feedlot pens (2 cows/pen). Treatments were randomly assigned to pens, and consisted of cows provided ground tall fescue hay only (55% TDN, 12% CP of DM; **Control**) or 70% of control hay DMI plus WBG DM supplementation at 0.5% of BW (75% TDN, 36% CP of DM) that was offered either daily (**WBG7**) or 3 times weekly (**WBG3**; Monday, Wednesday, Friday) until calving. Immediately after calving, cow-calf pairs were managed as a single group on 26-ha tall fescue pastures until weaning. Hay offer was adjusted weekly to ensure similar total TDN intake among treatments. Shrunk cow BW was obtained on d 0, at calving and weaning, whereas shrunk calf BW was obtained at birth and weaning. Overall hay DMI was similar between WBG3 and WBG7 cows ($P \geq 0.31$), but both had less hay DMI than control cows (6.7, 7.2 and 10.3 ± 0.56 kg/d, respectively; $P < 0.01$). Overall total DMI and TDN intake did not differ among treatments ($P \geq 0.37$). However, CP intake was greater for WBG3 and WBG7 vs. control cows (2.3, 2.1 and 1.5 ± 0.10 kg/d, respectively; $P \leq 0.05$). Cow BCS and BW loss from calving to weaning tended to be greater ($P \leq 0.07$) for control vs. WBG3 and WBG7 cows (−1.28 vs. −0.27 and −0.73 ± 0.29, and −0.78 vs. 0.05 and −0.31 ± 0.29 kg/d, respectively). Cow BW and BCS at calving and weaning, calf birth and weaning BW, and calf ADG from birth to weaning were not affected ($P \geq 0.16$) by cow gestational treatment. Hence, replacing 30% of hay DM intake with TDN-equivalent amount of WBG enhanced growth performance of cows during late gestation. Also, decreasing the frequency of WBG supplementation during late gestation was an effective management practice to decrease cow hay cost without impacting cow and pre-weaning calf growth performance.

Key words: Heifers, humoral immune, frequency, preconditioning rate, supplementation

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145 Evaluation of a Commercial Supplement in Sheep and Goat Twins.

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Dietary supplements are being used to benefit animal production and health. Studies in twins offer an opportunity to control genetic variability to better assess the impact of supplements. The objectives of this study were to evaluate the effect of the dietary supplement OMEGA-3*6*9 Kid & Lamb Plus (Durvet, Blue Springs, MO) on body weight of twins in sheep and goats. Twins from three Spanish/Boer goat nannies and three St Croix Sheep ewes from the North Carolina Agricultural and Technical State University farm were used. All adults and fifty percent of the progeny received this high calorie liquid dietary supplement at the recommended dose for 8 wk. The supplement was administered via oral drench at a dose of 5cc/day. Body weight was determined bi-weekly for 8 wk. All data were analyzed using SAS proc glm repeated measure procedure (SAS, Cary, NC). Body weight increased significantly over time ($P < 0.05$). However no treatment effect ($p > 0.05$) was observed and this may be due to the small sample size used. Overall, an average increase in body weight was observed in kids as well as in the lambs. The effect on body weight differed between species. Further, studies are needed to evaluate the observed trend of increased body weight in supplement treated twins from the same mother compared to untreated group. This study provides preliminary evidence for species specific effects of Omega fatty acid enriched supplements on sheep and goat body weight. Further studies using more animals including the use of twin studies to control genetic variability offer an opportunity for better definition of this effect. Levels of infection, genetic variability in susceptibility of goats to parasites and other factors may also influence the efficacy of the supplement used.

Key words: Twin goats, sheep, supplement, body weight

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146 Influence of temperament on the cell-mediated immune response in Brahman heifers.

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This experiment tested the hypothesis that temperament is associated with cell-mediated immune response (CMIR) of cattle. The 9 most temperamental (T) and 9 calmest (C) Brahman heifers were selected from 40 yearlings based on exit velocity (EV), pen score (PS), and temperament score (TS). A 2.5-mL s.c. injection of Quil-A adjuvant (750 μg) with *Candida albicans* (CALB; 50,000 protein nitrogen units: PNU) was given on the left neck and a 2.5-mL injection of physiological sterile saline (PSS) on the right neck (placebo) at d 0. A 0.5-mL s.c. injection of CALB (10,000 PNU) was given in the left caudal fold and an injection of 0.5-mL PSS in the right caudal fold (placebo) on d 14. Rectal temperature was recorded on d 0, 1, 7, 14, and 15 using a rectal thermometer, injection site temperature was recorded using a ThermaCam P65 on d 0, 1, 7, 14, and 15, and caudal fold thickness was recorded using Harpenden Skin Fold Calipers on d 14 and 15. Temperament variables differed between the T and C heifers as follow: EV (T = 2.94 ± .28 m/s: C = 1.37 m/s ± .26 m/s; $P < .0001$); PS (T = 4.79 ± .32: C = 1.99 ± .30; $P < .0001$); and TS (T = 3.9 ± .24: C = 1.7 ± .23; $P < .0001$) at d −10. Starting BW (T = 262.8 ± 9.5 kg: C = 273.6 ± 9.5 kg; $P = .4319$) and age (T = 387.1 ± 16.3 d: C = 374.9 ± 15.7 d; $P = .2856$) did not differ between T and C. The BW per day of age at d-10 (T = .56 ± .02 kg: C = .62 ± .02 kg; $P < .02$) differed between groups. Rectal temperatures were affected by a time by temperament interaction ($P = .0098$). The T heifers had higher rectal temperatures than C. The T heifers had a greater change in caudal fold temperature due to CALB from d14 to d15 ($P = .0447$). The CALB neck temperature differences over time and CALB caudal fold thickness measurements did not differ ($P > 0.1$). Also, T had greater rectal and CALB injection site temperatures compared to C but response to CALB was not affected by temperament. The hypothesis that temperament influences CMIR was rejected.

Key words: temperament, immunity, cattle

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1951–52	R.S. Glasscock	University of Florida
1950–51	H.H. Levek	Mississippi State University
1949–50	J.E. Foster	University of Maryland
1948–49	H.M. Briggs	Oklahoma State University
1947–48	E.C. Godbey	Clemson University
1946–47	J.C. Grimes	Auburn University
1941–42	R.E. Hunt	VPI & SU
1940–41	M.G. Snell	Louisiana State University
1939–40	L.E. Richardson	University of Tennessee
1938–39	E.W. Sheets	USDA
1937–38	L.I. Case	NC State University
1936–37	M.P. Jarnigan	University of Georgia
1935–36	J.B. Francioni	Louisiana State University
1934–35	A.L. Shealy	University of Florida
1933–34	L.V. Starkey	Clemson University
1932–33	W.L. Blizzard	Oklahoma State University

DISTINGUISHED SERVICE AWARD RECIPIENTS

2015	Tom Troxel	University of Arkansas
2014	Tom Welsh, Jr.	Texas A&M University
2013	Debra K. Aaron	University of Kentucky
2012	David Morrison	Louisiana State University
2011	Paul G. Harms	Texas A&M University
2010	Monte Rouquette, Jr.	Texas AgriLife Research
2009	Not Given	
2008	Ronald D. Randel	Texas A&M University
2007	A. Hayden Brown, Jr.	Arkansas
2006	Gary M. Hill	Georgia
2005	Samuel W. Coleman	USDA
2004	Don G. Ely	Kentucky
2003	Don E. Franke	Louisiana

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

EXTENSION AWARD RECIPIENTS

2015	Matt Hersom	University of Florida
2014	Les Anderson	University of Kentucky
2013	Christopher Richards	Oklahoma State University
2012	Michael Shane Gadberry	University of Arkansas
2011	Richard D. Coffey	University of Kentucky
2010	M. Todd See	North Carolina
2009	Eric van Heugten	North Carolina
2008	Ted McCollum	Texas A&M University
2007	Matthew H. Poore	North Carolina
2006	Allen F. Harper	Virginia
2005	Glen Selk	Oklahoma State University
2004	Roger L. McCraw	North Carolina
2003	Darrh Bullock	Kentucky
2002	Warren Gill	Tennessee
2001	Walter R. Burris	Kentucky
2000	Tom R. Troxel	Arkansas
1999	George V. Davis, Jr.	Arkansas
1998	G. L. Monty Chappel	Kentucky
1997	Steven H. Umberger	Virginia
1996	Clyde D. Lane, Jr.	Tennessee
1995	John T. Johns	Kentucky
1994	David W. Freeman	Oklahoma
1993	J.R. Jones	North Carolina
1992	James B. Neel	Tennessee
1991	Keith Lusby	Oklahoma
1990	Joe Hughes	Oklahoma
1989	Henry Webster	Clemson
1988	Donald R. Gill	Oklahoma
1987	H. John Gerken, Jr.	Virginia
1986	M.K. Cook	Georgia
1985	W.G. Luce	Oklahoma
1984	Charles Cooper	Virginia
1983	C.W. Absher	Kentucky
1982	C.M. Triplett	Georgia
1981	Arden N. Huff	Virginia
1980	A.L. Eller, Jr.	Virginia

YOUNG ANIMAL SCIENTIST AWARD RECIPIENTS

2015[1]	Christy Bratcher	Auburn University
2015[2]	Kristine Urschel	University of Kentucky
2014[1]	Kyle Stutts	Sam Houston State University
2014[2]	Christy Bratcher	Auburn University
2013[1]	Elizabeth Wagner	Auburn University
2013[2]	M. Carey Satterfield	Texas A&M University
2012[1]	Deb VanOverbeke	Oklahoma State University
2012[2]	Surendranath Suman	University of Kentucky
2011[1]	J. Chance Brooks	Texas Tech
2011[2]	J. Chance Brooks	Texas Tech
2010[1]	Deborah L. VanOverbeke	Oklahoma State University
2010[2]	Troy J. Wistuba	Morehead State University
2009[1]	Gretchen Hilton	Oklahoma State University
2009[2]	Michael L. Looper	USDA, ARS
2008[1]	Jodi A. Sterle	Texas A&M University
2008[2]	Jeffery Escobar	Virginia Tech
2007[1]	L. Anderson	University of Kentucky
2007[2]	S-W Kim	Texas Tech University
2006[1]	Michael L. Looper	USDA, ARS
2006[2]	Scott T. Willard	Mississippi State University
2005[2]	Clinton Krehbiel	Oklahoma State University
2004[1]	M. Todd See	North Carolina State University

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

[1] Education
[2] Research

NPB SWINE INDUSTRY AWARD RECIPIENTS

2015	P.R. Broadway	Texas Tech University
2014	M.D. Johnson	Texas A&M University
2013	J.R. Donaldson	Mississippi State University
2012	Mark Estienne	Virginia Tech
2011	Mark Estienne	Virginia Tech
2010	Jeffery A. Carroll	ARS, USDA
2009	Eric Van Heugten	NC State University
2008	Sung Woo Kim	North Carolina State Unversity
2007	Chad O'Gormon	Texas A&M University
2006	Jeffery A. Carroll	USDA, ARS
2005	Zelpha B. Johnson	University of Arkansas
2004	Jason Apple	University of Arkansas
2003	Theo van Kempen	North Carolina State University
2002	Kim Cole	University of Arkansas
2001	G.E. Conatser	University of Tennessee
2000	Not given	
1999	Not given	
1998	Robert A. Cushman	North Carolina State University
1997	M. Todd See	North Carolina State University
1996	William L. Flowers	North Carolina State University
1995	M. Todd See	North Carolina State University
1994	Robert Dove	University of Georgia

EMERGING SCHOLAR AWARD RECIPIENTS

2015	David Rosero	The Hanor Company
2014	Angela Mays	University of Arkansas
2013	Andrew P. Foote	University of Kentucky
2012	Julie Hicks	North Carolina State University
2011	R.S. Fry	North Carolina State University
2010	Christina Taylor-Edwards	University of Kentucky

GRADUATE STUDENT PAPER AWARD RECIPIENTS

YEAR	AWARDEE, MEETING | UNIVERSITY
2015	K.P. Sharon, Atlanta | Texas Tech University
2014	L.K. Mabry, Dallas | North Carolina State University
2013	P. Moriel, Orlando | University of Florida
2012	L.M. Wiley, Birmingham | Texas A&M University
2011	L.A. Smith, Corpus Christi | Auburn University
2010	J.S. Fry, Orlando | North Carolina State University
2009	S.J. Winterholler, Atlanta | Oklahoma State University
2008	S.L. Hansen, Dallas | North Carolina State University
2007	P. Williams, Mobile | Texas A&M University-Kingsville
2006	L.R. Legleiter, Orlando | North Carolina State University
2005	M.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
1984 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 Orlean | 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. Fieldsl, Jackonsville | 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 RECIPIENTS

YEAR	AWARDEE, MEETING | UNIVERSITY
2015	T. C. Rocha, Atlanta | Texas A&M University
2014	K. M. Doran, Dallas | Berry College
2013	A. Arellano, Orlando | Texas A&M University
2012	W. B. Smith, Birmingham | Auburn University
2011	J. Tyus, Corpus Christi | Tennessee State University
2010	W. N. Tapp III, Orlando | University of Arkansas
2009	C.M. Ballou, Atlanta | North Carolina State University
2008	C.R. Boldt, Dallas | Texas A&M University
2007	K. Starkey, Mobile | University of Arkansas
2006	D. Sykes, Orlando | Mississippi State University
2005	N. Burdick, Little Rock | Texas A&M University-Kingsville
2004	J. L. Roberts, Tulsa | Oklahoma State University
2003	M. Seitz, Mobile | Mississippi State University
2002	B. Spader, Orlando | University of Missouri
2001	R. Horsley, Ft. Worth | Virginia Polytechnic University
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 University
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

2015 Oklahoma State University
2014 Texas A&M University
2013 Oklahoma State University
2012 Texas A&M University
2010 University of Florida
2009 University of Georgia
2008 University of Kentucky
2007 Texas A&M University
2006 Texas A&M University
2005 North Carolina State University
2004 University of Kentucky
2003 Texas A&M University
2002 University of Florida
2001 University of Kentucky
2000 Texas A&M University
1999 University of Kentucky
1998 University of Kentucky
1997 Oklahoma State University
1996 Oklahoma State University
1995 Virginia Tech
1994 Oklahoma State University
1993 Texas A&M University
1992 Oklahoma State University
1991 University of Kentucky
1990 Virginia Tech
1989 Oklahoma State University
1988 Texas A&M University
1987 University of Georgia
1986 University of Georgia
1985 University of Kentucky
1984 Texas A&M University

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