

8. All cows received MGA (0.5 mg/head/day) on d 1 to 6. Estrus was detected from d 7 to 10 and cows AI 8 to 12 h after observed estrus. Cows not in estrus by d 10 were timed-AI and administered 100 µg GnRH (Fertagy1[®]). Cows were classified as cycling (progesterone ≥ 1 ng/mL on either d -10 or 0) and noncycling (progesterone < 1 ng/mL on d #10 and 0) on d 0. Regression of the corpus luteum (CL) was defined as cows with progesterone ≥ 1 ng/mL on d 7 and exhibited estrus or had progesterone < 1 ng/mL at timed-AI. Cycling status (CS), estrous (ER), conception (CR), timed-AI pregnancy (TAIPR), synchronized pregnancy (SPR), and CL regression (CLREG) rates were evaluated. There were no treatment x CS effects (P > 0.10) for any variable tested so data were pooled. The following responses were similar (P > 0.10) between single and split dose of PGF2α: CS (83/141 = 58.9%; 101/146 = 69.2%), ER (54/145 = 37.2%; 45/149 = 30.2%), CR (33/54 = 61.1%; 19/45 = 42.2%), TAIPR (30/91 = 33.0%; 43/104 = 41.4%), SPR (63/145 = 43.5%; 62/149 = 41.6%), and CLREG (72/85 = 84.7%; 90/102 = 88.2%). The TAIPR and SPR were greater (P < 0.05) for cycling (56/120 = 46.7%; 90/182 = 49.5%) than noncycling (17/69 = 24.6%; 33/103 = 32.0%) cows, respectively. For the noncycling cows on d 0, 40.2% (41/102) had progesterone ≥ 1ng/mL at PGF2α with CLREG (16/18 = 88.9% vs. 22/23 = 95.7%) being similar between single and split dose of PGF2α, respectively. In conclusion, split dose of PGF2α did not improve effectiveness of GnRH/PGF2α protocol nor enhance CL regression in lactating *Bos taurus* x *Bos indicus* cows.

Key Words: *Bos indicus*, GnRH, Melengestrol Acetate

63 Efficacy of a single versus a split dose of PGF2α in a GnRH + PGF2α estrous synchronization protocol combined with melengestrol acetate (MGA) in lactating Angus cows. G. A. Bridges*, G. P. Portillo, M. K. Shaw, J. W. de Araujo, and J. V. Yelich, *University of Florida, Gainesville*.

A GnRH + PGF2α protocol combined with MGA was used in Angus (n = 207) cows to evaluate the effectiveness of two PGF2α treatments. On experimental d 0, cows were equally distributed to treatments by days postpartum and body condition and received GnRH (100 µg; FERTAGYL[®]). On d 7, half the cows received either 25 mg PGF2α (single; LUTALYSE[®] Sterile Solution) or 12.5 mg PGF2α (split) on d 7 and 8. All cows received MGA (0.5 mg/cow/day) on d 1 to 6. Estrous detection was conducted for 72 h following PGF2α and cows were AI 8 to 12 h after an observed estrus. Cows not observed in estrus by 72 h after PGF2α were timed-AI (TAI) and received GnRH (100 µg; FERTAGYL[®]). Pregnancy was diagnosed by ultrasonography 50 to 60 d following TAI. Blood samples were taken on d -10, 0, 7, and at TAI for progesterone (P4) concentrations to determine cycling (P4 ≥ 1 ng/ml at either d #10 or 0) and non-cycling (P4 < 1 ng/ml at both d #10 and 0) status and corpus luteum regression (CLR). There was no treatment x cycling status effects for any variable so data were pooled. Estrous response was decreased (P < 0.05) in the split (n = 103; 58.3%) compared to the single (n = 104; 71.2%) treatment. Conception (n = 74; 56.8%; n = 60; 56.7%), TAI pregnancy (n = 30; 33.3%; n = 43; 27.9%), and overall AI pregnancy rates (SYNPR; n = 104; 50.0%; n = 103; 44.7%) were similar (P > 0.05) between single and split treatments, respectively. Estrous response tended (P < 0.1) and SYNPR were greater (P < 0.05) for cycling (n = 128; 68.8%; 52.3%) than non-cycling (n = 79; 58.2%; 39.2%) cows, respectively. In cows with P4 ≥ 1.0 ng/ml at PGF2α, CLR (sum of the estrous response and P4 < 1 ng/ml at TAI) was similar between the single (n = 56; 92.9%) and split (n = 64; 98.4%) treatments. In conclusion modifying PGF2α from a single to a split treatment reduced estrous response but had no effect on conception, TAI, SYNPR, and CLR rates in Angus cows.

Key Words: PGF2α, GnRH, Synchronization

66 Effect of Supplemental Copper on Copper Status, Calf Weaning Weights, and Reproduction in Beef Cattle. J. W. Spears*, K. E. Lloyd, C. L. Wright, T. E. Engle, M. E. Tiffany, and C. S. Whisnant, *North Carolina State University, Raleigh*.

A 2-yr study was conducted to determine the effects of Cu supplementation, from copper oxide needles, on Cu status and performance of beef cattle. In yr 1, 140 Angus (n = 65) and Simmental (n = 75) cows in

64 Influence of GnRH and estradiol on estrus and luteal activity of anestrous postpartum beef cows. I. Rubio, F. J. White, N. H. Ciccioli, and R.P. Wettemann*, *Oklahoma State University, Stillwater*.

Anestrous Angus x Hereford lactating cows were used to determine if treatment with GnRH or estradiol influences onset of first estrus and luteal activity. Thirty-four cows were randomly assigned to one of three treatments: GnRH (100 µg; Cystorelin, Abbott Laboratories; n = 12), estradiol cypionate (1 mg; Pharmacia & Upjohn, E; n = 12) or saline (S; n = 10). Ovarian follicles were evaluated by ultrasonography on two consecutive days at 40.5 (SD = 2.3 days) postpartum. If the dominant follicle was at least 10 mm in diameter at the first measurement, the cow was classified as < 11 mm or ≥ 11 mm. Body condition score (BCS) was measured and cows were classified as < 5 or ≥ 5. Blood samples were collected twice a week, starting at 30 d postpartum, then on the day before treatment (d #1), d 0, d 3, d 6 and every 3 d until day 22 post treatment to determine luteal activity (progesterone ≥ 0.5 ng/ml). Estrus was monitored with electronic mount detectors (HeatWatch) from d 30 until d 70 postpartum, and was defined as cows that received more than 2 mounts in 4 h. Cows lacked luteal activity and estrus before treatment. During 1 to 10 d after treatment, more GnRH cows (67%) had luteal activity than E cows (25 %; P < 0.10) or saline cows (0 %; P < 0.01), and E and S cows were not different (P > 0.10). Treatment did not influence the percentage of cows with luteal activity 13 to 20 d after treatment. Percentage of cows detected in estrus during 1 to 6 d after treatment was greater for E (58%) than GnRH (8% ; P < 0.05) or saline cows (0 %, P < 0.01), but was similar for GnRH and saline treated cows (P > 0.10). The number of cows in estrus during 7 to 20 d after treatment was not influenced by treatment. Follicle size and BCS did not influence the effect of treatment on estrus and luteal activity (P > 0.10). Treatment of postpartum anestrous cows with GnRH initiated luteal activity without estrus, and treatment with estradiol increased the incidence of estrus without altering luteal activity.

Key Words: Postpartum Beef Cow, Estrus, Luteal Activity

65 Estrous synchronization for beef heifers: CO-Synch versus Hybrid-Synch. B. K. Reed,*¹ and C. B. Rodgers², ¹*BKR Cattle Etc*, ²*Triple R Farms*.

Many studies have evaluated the synchronization of estrus. Although virgin heifers do not have the concerns associated with postpartum anestrous, and should be easier to synchronize, results using timed-breeding protocols are varied. We compared pregnancy rates of Brangus cross heifers subjected to two of the currently used synchronization programs. Heifers (n=145) were randomly allotted by weight to one of two treatments for the synchronization of estrus and ovulation. Only heifers that exhibited behavioral estrus twice before the beginning of the study were included. Approximately half of the heifers (n=73) received an injection of GnRH (100 µg; i.m.) on d 0, an injection of PGF2α (25 mg; i.m.) on d 7, and a second injection of GnRH (100 µg; i.m.) on d 9, coupled with timed insemination (CO-Synch). The remaining heifers (n=72) received an injection of GnRH (100 µg; i.m.) on d 0 and an injection of PGF2α (25 mg; i.m.) on d 7. Heifers were then observed from d 7 to d 11, and heifers exhibiting behavioral estrus were artificially inseminated. Any heifers not inseminated after detected estrus received an injection of GnRH (100 µg; i.m.) on d 12, coupled with timed insemination (Hybrid-Synch). First-service conception rates for heifers that received CO-Synch (93%) were not different (P > 0.10) than heifers that received Hybrid-Synch (85%). Both methods for the synchronization of estrus evaluated in this study resulted in extremely high pregnancy rates, with the only advantage being the elimination of estrous detection when using CO-Synch.

Key Words: Estrous Synchronization, CO-Synch, Hybrid-Synch

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their last trimester of pregnancy were blocked by breed and age and randomly assigned to treatments. Cows were given no supplemental Cu or a 25-g CuO needle bolus at the beginning of the study and at the start of yr 2. Calves born to Cu-supplemented cows were given a 12.5-g CuO needle bolus at approximately 3 mo of age. A free-choice mineral supplement was provided that contained all minerals typically supplemented to cattle with the exception of Cu. Cattle grazed pastures that

were predominately tall fescue during the grazing season and were fed hay, limited silage, and a protein supplement during the winter. Cows were synchronized and those showing estrus were bred AI followed by a 28-d natural mating period. In yr 2, cows remained in the same Cu treatment, and 2-yr-old heifers were added to the study to replace cows that were culled after yr 1. Liver Cu concentrations were higher ($P < 0.01$) in cows receiving a Cu bolus. Even 257 d following administration of the Cu bolus, liver Cu concentrations were 60% higher ($P < 0.01$) in Cu-supplemented cows. Calves, born to Cu-supplemented cows, that received a Cu bolus in March had liver Cu concentrations over 10-fold higher ($P < 0.01$) than controls in June. Calves born to Cu-supplemented dams had heavier ($P < 0.01$) birth weights in yr 1, but not in yr 2. Weaning weights of calves given a Cu bolus averaged 12.2 kg heavier ($P < 0.01$) than controls in yr 1, when adjusted for sex, calf age, and age of dam. Weaning weights tended ($P < 0.13$) to be higher for Cu-supplemented calves in yr 2. Cow reproductive performance was not affected by Cu. Results indicate that administration of a CuO needle bolus to beef cows and their calves is an effective method for providing Cu. Copper supplementation improved calf weaning weights.

Key Words: Copper, Beef Cattle

67 Effect of Selenium Supplementation of Beef Cows on Immune Responses of Weaned Beef Calves. P. A. Beck*¹, T. J. Wistuba², M. E. Davis², and S. A. Gunter¹, ¹Southwest Research and Extension Center, Hope, AR, ²Department of Animal Science, University of Arkansas, Fayetteville.

Selenium (Se) is an essential micronutrient, which can have substantial effects on immune function because of its role in the antioxidant enzyme glutathione peroxidase (GTH-Px). Eighteen spring-born Angus sired steers (BW = 200 ± 5.2 kg) were selected from six groups of 20 cow-calf pairs, to test the effects of feeding no selenium (Se), or 26 ppm of Se as sodium selenite or Se-yeast in a free-choice mineral supplement to cows before calving and during lactation on the whole blood Se, GTH-Px activity, and immune function of their weaned offspring. Twenty-two days after weaning, the steers were weighed and blood was collected via jugular venipuncture for analysis of whole blood Se, GTH-Px activity, lymphocyte proliferation, macrophage phagocytosis, and interferon- γ production. Cell-mediated immunity was tested by measuring swelling response to intradermal injection of phytohemagglutinin. Blood Se, GTH-Px activity, lymphocyte proliferation, macrophage phagocytosis, and interferon- γ data were analyzed as a completely randomized design. Skin-swelling response was analyzed as a split-plot in time experimental design. Supplementation with Se-yeast increased ($P < 0.05$) whole blood Se concentration by 214% and glutathione peroxidase activity by 258% compared to unsupplemented calves. Inorganic Se supplementation increased ($P < 0.05$) whole blood selenium by 92% and glutathione peroxidase activity by 196%. Supplementation with Se-yeast increased ($P < 0.05$) whole blood Se concentration by 63% and macrophage phagocytosis by 111% compared to supplementation with sodium selenite. Supplementation with Se-yeast also numerically increased ($P > 0.47$) proliferation of lymphocytes cultured with concanavalin A, phytohemagglutinin, and pokeweed mitogen compared to unsupplemented and sodium selenite supplemented calves. Interferon- γ production was not affected ($P = 0.20$) by Se supplementation. Swelling response was not affected ($P = 0.35$) by Se supplementation and the Se treatment by time interaction was not significant ($P = 0.80$). Supplementation of cow herds with Se-yeast before weaning has the ability to alter immune function and improve selenium status of weaned calves in marginally Se deficient conditions.

Key Words: Selenium, Beef Cattle, Immune Function

68 Feeding Value of Pelleted and Loose Soybean Hulls, and Corn Gluten Feed in Self-Feeding Programs for Backgrounding Calves. M. H. Poore*, North Carolina State University, Raleigh.

This trial was conducted to evaluate self-feeding pelleted (PSH) or loose (LSH) soybean hulls or loose corn gluten feed (CGF) compared to a diet of only hay. Eight groups of five calves each (Angus and Angus-cross, initial shrunk BW 234 kg) were fed at the Upper Mountain Research Station near Laurel Springs, NC. All groups received free-choice hay and mineral, and two groups received one of the three byproducts in a self-feeder. Endophyte-free fescue hay was of high quality (17.6% CP and 28.8% ADF), while PSH, LSH, and CGF were 14.1, 14.2, and 23.7% CP;

43.6, 43.3, and 11.9% ADF; and 2.3, 2.6, and 15.5% starch, respectively. The CGF was 0.56% sulfur. Cattle were hand-fed an increasing amount of byproduct for 1 wk and then were fed all they would consume for the remainder of the 83-d trial. No health problems were observed. Differences presented indicate $P < 0.05$ and means are presented ± SEM. Cattle fed the byproducts ate less hay than the control while cattle on CGF consumed more hay than those on PSH or LSH (6.86, 3.20, 2.57, and 5.09 ± 0.199 kg/d for hay, PSH, LSH, and CGF, respectively). Byproduct intake differed for each treatment (6.27, 7.57, and 2.75 ± 0.199 kg/d for PSH, LSH, and CGF, respectively). Total dry matter intake as kg/d or % of BW differed for each treatment (6.92, 9.52, 10.21, and 7.90 ± 0.081 kg/d; and 2.54, 3.19, 3.40, and 2.79 ± 0.017% of BW for hay, PSH, LSH, and CGF, respectively). Daily gain (determined using 24-h feed and water withdrawal) was lowest for hay, highest for PSH and LSH, and intermediate for CGF (0.96, 1.55, 1.59, and 1.20 ± 0.049 kg/d for hay, PSH, LSH, and CGF, respectively). Gain/feed was not influenced by treatment (0.139, 0.163, 0.156, and 0.155 ± 0.006 for hay, PSH, LSH, and CGF, respectively). Ruminal fluid samples (obtained by rumenocentesis) showed that acetate:propionate ratio was higher for PSH and LSH than for CGF or hay (3.61, 4.68, 4.38, and 3.22 ± 0.139 for hay, PSH, LSH, and CGF, respectively), while ruminal pH was not influenced by treatment (6.63, 6.49, 6.26, and 6.72 ± 0.092 for hay, PSH, LSH and CGF, respectively). In this study all three byproduct concentrates were fed successfully. Loose soybean hulls resulted in slightly higher intake than PSH with similar daily gain.

Key Words: Soybean Hulls, Corn Gluten Feed, Backgrounding Calves

69 Cool-Season Annual Swards with Legumes to Supplement Wintering Beef Cows. T. G. Montgomery*¹, W. A. Whitworth², and S. A. Gunter³, ¹University of Arkansas-Monticello, ²Southeast Research & Extension Center, Monticello, AR, ³Southwest Research & Extension Center, Hope, AR.

On 21 December 2001, 50 beef cows nursing calves (552 ± 9.4 kg ± SE; calving started on 22 September 2001), stratified by breed, body condition score (BCS), BW, and cow age, were divided randomly into six groups and assigned to one of six cool-season annual swards (0.45 ha/cow) that had been inter-seeded into a dormant bermudagrass/dallisgrass pasture in October. All groups had *ad libitum* access to a warm-season grass hay (12% CP; 58% TDN) plus the sward containing the following forages as the treatment: 1) wheat and ryegrass (WRG; control group), 2) wheat and ryegrass plus red clover (WRR), or 3) wheat and ryegrass plus white and crimson clovers (WRW). Wheat, ryegrass, and red, white, and crimson clovers were seeded at rates of 101, 25, 9, 4, and 12 kg of seed/ha, respectively. Beginning the second week in December, cows were synchronized with SelectSynch, and were subsequently inseminated to a Beefmaster sire on observed estrus. On December 21, a bull that had passed a breeding soundness examination was placed with each group for a 60-d breeding season. Data were analyzed by ANOVA and contrast statements were used to compare WRG versus the average of WRR and WRW, and WRR versus WRW. Body weight and BCS did not differ ($P \geq 0.15$) between cows grazing WRG and the average of cows grazing WRR and WRW; however, cow BW on March 21 did tend ($P = 0.08$) to be greater for cows grazing WRR than for cows grazing WRW. Calf birth weight did not differ ($P = 0.65$) between WRG and the average of WRR and WRW and there was no difference ($P = 0.55$) between WRR and WRW. Calf BW on any date and ADG did not differ ($P \geq 0.25$) between WRG and the average of WRR and WRW. There were no differences ($P \geq 0.17$) between WRR and WRW in ADG or calf BW on any date. Cows grazing WRG seem to perform as well as cows grazing swards fortified with red clover (WRR) or white and crimson clovers (WRW).

Key Words: Beef Cows, Legumes, Pastures

70 The Effect of a Condensed Tannin-Containing Forage on Methane Emission by Goats. R. Puchala*, B. R. Min, A. L. Goetsch, and T. Sahl, *E (Kika) de la Garza Institute for Goat Research, Langston University, OK.*

The objective of this study was to investigate the effect of dietary condensed tannins from *Sericea lespedeza* (*Lespedeza cuneata*; 6% condensed tannins; SL) on methane emission by goats. The experiment was conducted with Angora does that had grazed SL (n = 6; 43 ± 2.7 kg BW) or crabgrass/tall fescue forage (CF; n = 6; 40 ± 2.7 kg BW) for approximately 4 months. After 5 d of adaptation to metabolism crates, gas

exchange was measured for 24 h in an open-circuit respiration calorimetry system with four head boxes (Sable Systems; Henderson, NV). Heart rate (HR) was monitored using Polar S610 heart rate monitors (Polar Electro, Woodbury, NY). Goats began adaptation periods sequentially in three sets, with two SL and two CF does in each set. During adaptation and measurement periods, freshly cut forages were fed three times daily. Concentrations of CP were 10.3 and 13.0% DM and *in vitro* DM digestibility (with NDF as the end-point measure) was 64.5 and 75.3% for SL and CF, respectively. Dry matter intake (1.29 vs 0.68 kg/d) and digestible DMI (0.84 vs 0.51 kg/d) were greater ($P < 0.01$) for SL vs CF. Daily energy expenditure (432 vs 439 kJ/kg BW^{0.75}) and methane emission (12.4 vs 10.9 L/d for SL and CF, respectively) were similar between treatments. However, daily methane emission relative to DMI (8.5 vs 18.8 L/kg) and digestible DMI (13.2 vs 25.0 L/kg) were considerably lower ($P < 0.01$) for SL than for CF. Treatment had no effect on HR (75.5 vs 74.7/min) or the ratio of daily energy expenditure to average HR per minute (5.73 vs 5.88 kJ/kg BW^{0.75} for SL and CF, respectively). In conclusion, condensed tannins in forages such as SL may provide a means of decreasing methane emission by ruminants.

Key Words: Methane, Angora Goats, Condensed Tannins

71 Tifton 85 and Alicia Bermudagrass Hay and Supplement Intake and Digestion by Steers. G. M. Hill¹, S. Savage¹, R. N. Gates², R. D. Hatfield³, B. C. Hand¹, and B. G. Mullinix, Jr.¹, ¹University of Georgia, Tifton, GA, ²USDA-ARS, Tifton, GA, ³US Forage Research Center, Madison, WI.

Tifton 85 (T85) and Alicia (A) bermudagrass hays harvested August 9 (5-wk) and September 30 (7-wk) were fed with a supplement (SUP) to steers to determine DMI and digestibility. Meadows (0.81 ha) of A and T85 received poultry litter (January and April, total 17.92 t/ha) and fertilizer (4 monthly applications, total 269 kg N/ha; plus 56 kg K₂O/ha, June 17). Beef steers (n = 24; BW = 314.8 ± 15.2 kg) were randomly assigned to treatments (TRT) in a completely random design. Digestion and DMI data were analyzed as a 2 × 2 factorial with initial BW class as blocks and DMI in a 7-d standardization period (SP) as a covariate. Steers were individually-fed Tifton 85 hay free-choice with SUP (2.3 kg/steer daily; 12.5% CP; 87.5% corn, 10% soybean meal, 2.15% minerals and vitamins) in the SP, followed by four TRT hays with SUP in a 14-d treatment period (TP). Chromic oxide was fed in SUP (10 g/steer daily, d 12 to d 20) as a marker, and fecal samples (12 /steer; d 17 to d 21) were analyzed for Cr and nutrients. Hay DM, CP, ADF, NDF, and ADL (% DM basis), respectively, were: A 5-wk = 92.1, 11.7, 36.6, 72.2, 5.3; A 7-wk = 91.9, 11.4, 37.2, 71.5, 4.9; T85 5-wk = 91.8, 10.2, 36.7, 71.8, 5.0; T85 7-wk = 91.6, 11.8, 37.8, 74.0, 5.2. Main effect means (Table) for hay ether ferulic acid (EFA; mg/g cell wall), for TP dietary DMI (kg), and apparent digestion (%) had no hay × maturity interactions ($P > 0.10$). Digestion of OM, CP, ADF, and NDF were higher for diets with T85 than A, and digestion was not affected ($P > 0.10$) by initial BW classification. Higher OM and CP digestion of 7-wk hay diets resulted from increased pre-harvest rainfall. Lower EFA in lignin of T85 hays contributed to higher digestibility of diets with T85 than with A.

Item	A	T85	SE	P <	5-wk	7-wk	SE	P <
EFA	7.7	5.6	0.27	0.01	6.6	6.6	0.27	ns
DMI	6.1	6.2	0.19	ns	6.5	5.8	0.18	0.01
OM	72.5	78.5	0.96	0.01	74.0	77.7	0.89	0.05
CP	72.2	75.5	0.98	0.05	72.6	75.2	0.91	0.10
ADF	67.2	74.7	1.21	0.01	69.6	72.3	1.13	ns
NDF	64.4	75.3	1.28	0.01	68.7	71.1	1.19	ns

Key Words: Steer, Hay, Digestion

72 Effect of Fatty Acid Profile on In Situ and In Vitro Digestibility of Raw Soybean in Grazing Cattle. B. C. Housewright¹, L. L. Pickering¹, H. L. Richardson¹, D. D. Kee², J. Heitholt³, V. Pantalone⁴, and K.W. Davenport, ¹Texas A&M University - Commerce, ²Texas Cooperative Extension Service, ³Texas Agricultural Experiment Station - Dallas, ⁴University of Tennessee, Knoxville.

Development of soybean cultivars that vary in fatty acid profile, in order to meet an increasing demand in human nutrition, could alter their digestibility in ruminants. A total of eight soybean cultivars were used to determine if variations in fatty acid profile would have an effect on *in situ*

and/or *in vitro* digestibility of soybean in grazing cattle. Two cultivars were selected that represented the average fatty acid profile of soybean. Other cultivars were selected based on variation of one or more fatty acids: Low Linolenic, Low Palmitic, Low Palmitic and Linolenic, High Stearic, High Oleic, and High Palmitic. For *in situ* and *in vitro* trials, ruminal fluid was extracted from a ruminally cannulated cow grazing Coastal bermudagrass pasture with no additional feed supplement. *In situ* and *in vitro* trials were performed identically. Samples from each cultivar were ground to pass through a 1-mm screen and subsamples were taken for *in situ* and *in vitro* trials. Eight samples from each cultivar were incubated, with a sample from each cultivar removed at 3, 6, 9, 12, 15, 18, 21, and 24 h of incubation. Cultivar had no effect on DM digestibility (DMD) at any incubation time in either *in situ* or *in vitro* trials ($P > 0.05$). Digestibility of all cultivars, *in situ* and *in vitro*, increased ($P < 0.05$) through 12 h. After 12 h of incubation, no additional increases ($P > 0.05$) in DMD were detected, *in situ* or *in vitro*. *In vitro* digestibility increased ($P < 0.05$) from 69.02% at 3 h to 76.69% at 12 h. *In situ* digestibility increased ($P < 0.05$) from 88.55% at 3 h to 95.52% at 12 h. Rates of DMD showed similar patterns, *in situ* and *in vitro*, but *in situ* rates were approximately 20 percentage units higher. This study suggests that digestion rates of soybean are not affected by fatty acid variations due to cultivar differences, and DMD is maximized at 12 h of incubation. Supported by Texas Soybean Board.

Key Words: Raw Soybean, Fatty Acid, Dry Matter Digestion

73 Evaluation of Rice Mill Feed in Diets Fed to Beef Cattle. W. N. Stacey* and D. L. Rankins, Jr., Auburn University, AL.

Rice mill feed is a low-cost by-product similar to broiler litter in that it contains high concentrations of ash and fiber. Two trials were conducted to evaluate the effects of replacing broiler litter with rice mill feed (RMF) on nutrient digestibilities and growth rate. In Trial 1, 40 predominantly Angus steers (initial body weight = 277 kg) were fed one of four diets over a 112-day period (five steers/pen; two pens/diet). On a dry matter basis, diets were as follows: 1) 47% broiler litter:53% corn, 2) 60% RMF:40% corn, 3) 50% RMF:50% corn, and 4) 40% RMF:60% corn. All diets were fed free-choice, and bermudagrass hay also was offered free-choice. Daily gains were greater ($P < 0.06$) for diets 3 and 4 (1.3 and 1.3 kg/d, respectively) than for diets 1 and 2 (0.9 and 1.0 kg/d, respectively). Daily feed intakes were not different ($P > 0.10$) among diets (9.9, 9.8, 9.9, and 9.7 kg/d, respectively). However, hay intake was greater ($P < 0.05$) for steers consuming diet 1 (2.7 kg/d) than for diets 2, 3, or 4 (1.0 kg/d). In Trial 2, 16 Angus × Charolais steers (initial body weight = 277 kg) were fed the same four diets while housed in individual metabolism stalls and nutrient digestibilities were determined. Daily dry matter intake was not different ($P > 0.10$) among diets (4.8, 5.5, 5.4, and 5.5 kg/d, respectively). Nutrient digestibilities did not differ among diets ($P > 0.10$). Nutrient digestibilities (%) for the four diets were as follows: DM - 73.6, 69.0, 74.2, and 70.8; OM = 74.4, 70.2, 75.9, and 72.1; NDF = 62.9, 60.6, 65.7, and 61.9; and ADF = 57.3, 56.9, 61.0, and 59.6, respectively. Rice mill feed can be used to replace broiler litter to formulate low-cost diets for stocker calves.

Key Words: Beef Cattle, Broiler Litter, Rice Mill Feed

74 Ruminal Dry Matter Disappearance Using Dacron or F57 Bags. M Yavuz¹, C. J. Richards¹, A. M. Saxton¹, J. L. Klotz¹, and J. C. Waller¹, ¹The University of Tennessee, Knoxville, TN.

In situ digestion is a widely accepted procedure for estimating rates of ruminal degradation. These procedures traditionally use dacron bags designed for ruminal incubation. After incubation, sample residues must be removed from the dacron bag for additional analyses such as ADF and NDF. An alternative may be the F57 bag developed by ANKOM Technology (Fairport, NY) for *in vitro* digestion and fiber analyses. The potential exists for these bags to be used for *in situ* digestion and the residue in that bag could be further analyzed for CP, NDF, ADF, or ash within the bag. The objective of this experiment was to compare ruminal *in situ* degradation rates of feedstuffs determined in dacron and F57 bags. Feedstuffs used for the comparison were alfalfa hay (*Medicago sativa*), bermudagrass hay (*Cynodon dactylon*), Kentucky 31 endophyte infected hay (*Festuca arundinacea*), corn, soybean hulls, and soybean meal. A ruminally cannulated cow fed a diet of 80% alfalfa cubes and

20% of a grain mix at a maintenance energy level with adequate degradable intake protein was used to incubate all feedstuffs. Feedstuffs were incubated for 0, 6, 12, 24, 72, and 96 h. *In situ* DM disappearance rates were calculated for each feedstuff using SAS proc nonlinear statement. *In situ* DM disappearance rates were similar for alfalfa ($24.1 \pm 0.01\%/h$) and soybean meal ($26.0 \pm 0.01\%/h$). Corn DM disappearance rate ($16.4 \pm 0.01\%/h$) was different ($P \leq 0.05$) than all others. Bermudagrass, tall fescue, and soybean hulls DM disappearance rates were similar and ranged from 6.2 ± 0.01 to $8.0 \pm 0.01\%/h$. *In situ* DM disappearance rates were similar ($P = 0.05$) for dacron and F57 bags. The average for all feedstuffs was $14.4 \pm 0.009\%/h$ for the dacron bags and $14.6 \pm 0.008\%/h$ for the F57 bags. There were no treatment x feedstuff interactions. These results suggest that F57 bags may be used for *in situ* incubations with similar DM disappearance rates to dacron bags. In addition, sample residue in the F57 bag may be directly subjected to additional analyses.

Key Words: Ruminants, Digestion, Measurement

75 Stocking Rate - Plant, Animal, and Environmental Implications. F. M. Rouquette*, *Texas Agricultural Experiment Station.*

Pasture stocking rate is the single most important factor controlling forage morphology and regrowth, animal performance, gain per unit land area, grazing behavior, efficiency of sward utilization, distribution and total quantity of defecation, and economic returns. Stocking rate recommendations to end users are site specific and management controlled due to forage species, climatic conditions, management input, duration of stocking, and gain per animal vs gain per area expectations. Multiple stocking rates used to create graded levels of herbage mass provide valuable forage-animal relationships which identify management boundaries of forage sustainability and production risks. In general, as stocking rates are increased, herbage mass decreases and subsequent animal performance declines. Forage response to stocking rate is species dependent with respect to changes in morphology, nutritive value, DM production, and survival. Method of stocking, continuous, rotational, strip, mob, etc., influences effects of stocking rate on plant, animal, and environmental parameters. Several experiments have shown a negative, linear relationship between average daily gain (ADG) and stocking rate. However, there has been shown to be an asymptotic relationship between ADG and herbage mass. Long-term stocking rate experiments on perennial pastures can provide valuable information on nutrient cycling which, in turn, has impact on nutrient management plans for pastures. Design and duration of stocking rates on pasture-animal performance can have profound effects on implementation strategies used by clientele and their resultant economic success. Stocking rate experiments have often taken the direction of short-term, objective-driven goals rather than year-long scenarios for producer-management. Attention needs to be diverted to follow-up data collection to quantify stocking rate effects on forage sustainability, compensating animal growth, and nutrient accountability in the environment.

Key Words: Stocking Rate, Forage, Animal Performance

76 Animal and Plant Responses to Stocking Rate. G. E. Aiken* and M. L. Looper, *USDA-ARS, Dale Bumpers Small Farms Research Center, Booneville, AR.*

Stocking rates that livestock producers choose to graze pastures will be a critical factor in meeting their economic goals and sustaining pasture productivity. This is primarily because stocking rate will determine the efficiency of production, production per unit land area, and depending on the grazing intensity imposed, increase the need for inputs of fertilizer and weed control. Therefore, both the biologic and economic implications of increasing or decreasing stocking rates must be understood to maintain stability and profit potential of a forage system. Stocking rate experiments conducted over the past forty years have typically reported linear declines in average daily weight gain as stocking rate increased. This linear trend in average daily gain with increases in stocking rate has been directly related to parallel declines in forage mass, but factors other than forage quantity can also affect intake of digestible dry matter. As canopies are grazed to lower heights, changes in forage quality, bulk density, and morphology can occur to grasses that alter selective grazing and dry matter intake by grazing livestock. Heavy grazing intensities can also shift the botanical composition over a period of time

from desirable to less desirable forage species. It is possible that actual trends in average daily gain over a range of stocking rates could be slightly non-linear, but the precision of most grazing experiments is too low to allow detection.

Key Words: Forages, Grazing, Stocking Rate

77 Effect of Cattle Price and Contract Grazing on Economic Optimum Stocking Rates for Stockers. D. I. Bransby*, *Auburn University, Auburn, AL.*

In most economic analyses of results from stocking rate experiments with young beef cattle, it has been assumed that animals were bought and sold at the same price per kg, or that any differential between buying and selling price is equal across stocking rates. These assumptions often result in identification of economic optimum stocking rates that are somewhat lower than the stocking rate that results in maximum animal gain per ha. However, in commercial markets, price per kg of cattle decreases as animal body weight increases. In addition, the difference between beginning and end weights of cattle (and therefore, the difference in buying and selling prices per kg) varies according to stocking rate. This means that the assumptions used in previous economic analyses of data from stocking rate experiments did not take into account typical market conditions, and are therefore invalid. Furthermore, no economic analyses have been conducted on stocking rate data, assuming that pastures were contract grazed for a fixed price per kg of gain. Analysis of data from a stocking rate experiment in which stockers were grazed on annual ryegrass indicated that when these factors are taken into account, the economic optimum stocking rate is equal to or close to the stocking rate that results in maximum animal gain per ha.

Key Words: Economic Optimum Stocking Rate, Stockers, Grazing

78 Effect of Grazing on Subsequent Animal Response: Performance, Body composition, Visceral Organs, and Nutrient Flux. C. R. Krehbiel*, M. J. Hersom, and G. W. Horn, *Oklahoma State University, Stillwater.*

Most of the energy consumed in ruminant production systems is derived from ad libitum consumption of forage. Maintenance and growth of grazing ruminants depends on the animal's ability to consume and extract usable energy from forage. Forage species and seasonal patterns of forage growth result in variations in forage availability and nutritive value, which can influence forage intake, nutrient metabolism, body composition, subsequent feedlot performance, and potentially carcass traits. It has been suggested that alterations in body composition through previous nutrition can alter NE_m requirements of growing cattle. The Level 1 Model of NRC (1996) suggests that as body fat content of cattle increases at a given BW, ME allowable ADG decreases. This implies that greater body fat content of cattle entering the feedlot decreases subsequent performance. In contrast, grazing systems that restrict growth and limit body fat accretion can positively affect cattle performance through compensatory growth, and alter composition of BW gain in the feedlot. Limiting energy intake during the grazing phase has been shown to increase mature size and carcass protein:energy. However, differences in initial body composition following grazing can be effectively minimized by the end of the feedlot phase if all cattle are fed to the same backfat endpoint. A positive correlation exists between fasting heat production and visceral organ mass, because visceral tissues and liver account for 40 to 65% of total body oxygen consumption. Changes in visceral organ mass, and therefore energy use, may change the amount of energy and protein available for growth. In addition, extensive inter-conversions and metabolism in the rumen and nutrient metabolism by portal and hepatic tissues often appear to have little effect on nutrients available to peripheral tissues. However, mechanisms by which these organs adjust to provide needed nutrients to other tissues and the regulatory interactions between these tissues and other body organs are not well understood. The objective of this review is to provide information on utilization of grazed forages and their effects on visceral and liver organ weights, net nutrient flux, subsequent performance, and body composition.

Key Words: Grazing Ruminants, Splanchnic Tissues, Compensatory Growth

79 Environmental Considerations for Grazing Management. P. A. Moore*¹, B. E. Haggard¹, S. Formica², P. B. DeLaune³, and B. C. Bellows⁴, ¹USDA/ARS, Fayetteville, AR, ²Arkansas DEQ, Little Rock, AR, ³University of Arkansas, Fayetteville, AR, ⁴ATTRA, Fayetteville, AR.

Excessive nutrient runoff from pastures is currently a problem in many areas of the country since it results in eutrophication of adjacent waterbodies. Over-grazing can result in compaction of the soil surface, which increases the amount of runoff, aggravating this problem. The objectives of this research were to evaluate the effects of over-grazing versus haying on runoff from pastures and to determine if simple remediation strategies such as pasture renovation could reduce the amount of runoff from over-grazed pastures. Two studies were conducted. In the first experiment, small (1 x 2 m) plots were constructed on land cropped to tall fescue that was either hayed, over-grazed, or over-grazed with cattle trails. Rainfall simulators were used to provide a 7 cm/h storm for one hour on two consecutive days. Runoff volumes were significantly lower for the hayed area (14.6 L) than for the over-grazed pasture (36.5 L) or the over-grazed area with cattle trails (47.3 L). These differences were attributed to higher bulk densities at the soil surface, which was believed to be due to compaction from cattle. In the second experiment the effects of pasture renovation on infiltration and runoff were evaluated on two soils under three fertilization regimes (unfertilized, swine manure, or poultry litter). The time to runoff was significantly longer on renovated land, infiltration was greater, and runoff was less. On average the amount of runoff was reduced by 45% with renovation, which translated into reductions in nutrient runoff of the same magnitude. These data indicate that pasture renovation and/or converting fields with high runoff potential from pastures to hay fields may be two best management practices to reduce nutrient runoff.

Key Words: Grazing, Runoff, Eutrophication

80 Winter Pasture Grazing Performance Effects on Feedlot and Carcass Traits in Cattle. J. J. Cleere*¹, A. D. Herring², J. W. Holloway³, H. Lippke³, C. R. Long¹, M. F. Miller⁴, K. R. Pond⁴, F. M. Rouquette¹, and B. G. Warrington³, ¹Texas A&M University, Overton, ²Texas A&M University, College Station, ³Texas A&M University, Uvalde, ⁴Texas Tech University, Lubbock.

During two successive years, steers (n = 189) and heifers (n = 72) were assigned to two stocking rates (SR) at the Texas Agricultural Experiment Stations in Uvalde (UVL) and Overton (OVT) to create different pre-feedlot growth rates. Animals were Angus, Angus x Angus-Brahman, Angus x Brahman-Hereford, Brahman, Hereford x Brahman, Braunvieh cross, or Bonsmara cross and stocked on TAM 90¹ annual ryegrass (*Lolium multiflorum*) (RG) in UVL or Maton¹ rye (*Secale cereale*) and RG in OVT from December-January to mid-May. Cattle were placed on feed at the Texas Tech University Alltech research feedlot in May 2000 and May 2001 to determine the influence of grazing growth rate (GGR) (High, Medium, and Low gains) on feedlot and carcass traits. Cattle were assigned to pens within location, breed type, stocking rate, sex, and weight with 4 to 7 animals per pen. Separate individual animal analyses were conducted for each location and sex. Feedlot performance of the UVL steers and OVT heifers was not affected by GGR. The OVT low and medium GGR steers had higher final feedlot ADG than the high GGR steers (1.83 and 1.79 vs 1.59 kg/d, respectively; P < 0.05). Final feedlot weights of the low and medium GGR animals within the three groups were lower than the high GGR animals due to an apparent failure to compensate for differences in initial feedlot weight (P < 0.05). The GGR affected hot carcass weight of all cattle (P < 0.05). The GGR affected total carcass value in the UVL steers and OVT heifers (P < 0.05), and in the OVT steers (P = 0.06). Cattle with higher gains during the winter grazing period had heavier final feedlot weights and carcass weights and subsequently higher carcass values. Stocking rate on pasture affected GGR and carcass traits, but had modest influence on animal performance in the feedlot. Thus, compensatory feedlot gains due to previous GGR was not a significant factor in this two year experiment.

Key Words: Beef Cattle, Feedlot Performance, Ryegrass

81 Season-Long Versus Intensive-Early Stocking at Two Nitrogen Fertilization Rates with Stocker Cattle Grazing Bermudagrass/Dallisgrass Pasture. L. G. Driggers¹, S. A. Gunter*², P. A. Beck², and M. J. Phillips², ¹Department of Agricultural and Extension Education, University of Arkansas, Fayetteville, ²Southwest Research & Extension Center, Hope, AR.

The objectives of this project were to compare the effects of season-long (SLS) with intensive-early stocking (IES) of pastures with different rates of N fertilization on the performance of grazing stocker cattle on pasture and in the feedlot. On April 17 (d 0), 82 Angus sired calves (BW = 225 ± 5.5 kg) were assigned randomly to one of twelve dallisgrass/bermudagrass pastures (0.81 ha each). One of the following three treatments was randomly applied to four pastures: 1) SLS with 169 kg/ha N fertilizer over the 168-d grazing period (4.9 steers/ha), 2) IES with 85 kg/ha N fertilizer over the 84-d grazing period (9.9 steers/ha), and 3) IES with 169 kg/ha of N fertilizer over the 84-d grazing period (9.9 steers/ha; IES+N). After the grazing phase was completed, cattle were finished in a commercial feedlot in western Oklahoma. Data were analyzed by ANOVA and contrast statements were used to compare SLS versus the average of IES and IES+N, and IES versus IES+N. By d 84 (July 10), SLS cattle were 29 kg heavier (P < 0.01) than the average of the IES and IES+N cattle; however, the IES+N cattle tended (P = 0.12) to be 16 kg heavier than the IES cattle. Total BW gain/ha was 31% greater (P = 0.02) for SLS cattle than the average of the IES and IES+N cattle. The IES+N cattle gained 44% more (P = 0.07) BW/ha than the IES cattle. In the feedlot, the ADG for the average of the IES and IES+N cattle (184 d on feed) was 12% greater (P = 0.03) than the SLS cattle (161 d on feed); ADG for IES cattle did not differ (P = 0.77) from IES+N cattle. Using SLS increased (P < 0.01) dressing percentage by 3% (P < 0.03) and fat thickness over the twelfth rib tended to decrease by 26% when compared to the average of IES and IES+N. No other carcass characteristics of the IES and IES+N cattle differed (P ≥ 0.24) from SLS cattle and there were no differences (P ≥ 0.33) between IES and IES+N.

Key Words: Beef Cattle, Grazing Systems, Fertilizer

82 Performance of Romosinuano Steer Calves as Winter Stockers for the Southern Great Plains. W. A. Phillips*¹, S. W. Coleman², D. G. Riley², C. C. Chase², and H.S. Mayeux¹, ¹USDA-ARS, Grazinglands Research Laboratory, El Reno, OK, ²USDA-ARS Subtropical Agricultural Research Station, Brooksville, FL.

Beef calves must be genetically equipped to withstand the climatic conditions of the coastal region of the Southern US to be productive. However, after weaning they may be transported to more temperate regions for growth and finishing. The objective of this experiment was to determine the performance of a new tropical breed reared in a tropical environment but grown in a temperate environment. In the fall of 2001, approximately 21 d after weaning, Romosinuano (n = 36) and Angus (n = 18) steers born and reared at Brooksville, FL were transported 2,025 km to El Reno, OK. Twenty-eight days after arrival, calves were blocked by breed and randomly assigned to graze one of three winter wheat pastures. One-third of the Angus and one third of the Romosinuano calves within each pasture were weighed after 10, 20, or 30 d of grazing to determine the rate of gain at 10-d intervals when exposed to winter wheat pasture for the first time. All weights were taken at approximately 1000 without fasting. Initial BW at the beginning of the 30-d grazing period were similar (P = 0.65) between the two breeds (Angus = 212 kg and Romosinuano = 208 kg). Angus calves tended (P = 0.15) to gain weight more rapidly than Romosinuano calves, but the impact of the sudden shift to a diet of winter wheat forage was similar between the two breeds. During the first 10 d of grazing, calves lost 7.4 kg of BW. By d 20, the calves had recovered most the weight lost and had BW similar to those observed on d 0. After 30 d of grazing winter wheat, Angus calves had gained 10.5 kg and Romosinuano calves had gained 5.2 kg. Romosinuano calves gained weight at a slower rate than Angus calves reared in a subtropical environment, but the capacity to adapt to the unique chemical and physical characteristics of winter wheat pasture were similar between Angus and Romosinuano calves.

Key Words: Stocker Calves, Adaptation, Wheat Pasture

83 Comparison of Respiration Rate, Body Temperatures, and Temperament in Temperate and Tropically Adapted Beef Steers. R. J. Hollenbeck^{*1}, S. T. Willard², T. H. Welsh¹, and R. D. Randel³, ¹Texas Agricultural Experiment Station, College Station, ²Mississippi State University, Starkville, ³Texas Agricultural Experiment Station, Overton.

In order to measure variation in thermoregulation and temperament, 46 yearling steers [Angus (A), n=8; Brahman (B), n=10; Bonsmara (BM), n=10; Bonsmara x Angus (BA), n=9; Braunveigh crossbred (BV), n=9] maintained on ryegrass overseeded on Coastal bermudagrass were used. Average ambient temperature was 24.06 ± 0.13 C, with relative humidity of 41.96 ± 0.57 % and temperature-humidity index value of 69.68 ± 0.12. Respiration rates, rectal temperatures, digital infrared thermography imaging (DITI) data, and temperament (TPT) scores were obtained as the steers came through a squeeze chute. DITI techniques detected differences in dorsal heat between A (37.6 ± 0.4C) and BM (36.4 ± 0.4C, P < 0.05), with intermediate values for B (37.2 ± 0.3C), BV (36.8 ± 0.7C), and BA (36.7 ± 0.4C). DITI of each animal's right side found A (36.5 ± 0.4C) to be warmer than B (35.9 ± 0.3C, P > 0.10), BA (35.5 ± 0.4C, P < 0.05), BM (35 ± 0.4C, P < 0.05), and BV steers (34.9 ± 0.5C, P < 0.05). DITI of the dorsal surface and right side were positively correlated with respiration rate (r = 0.48, P < 0.0006; r = 0.44, P < 0.002). Respiration rate differed among breeds, with A taking 71.2 ± 4.5 breaths per min (BPM), compared to 56.6 ± 4 for BM and 56.3 ± 4.3 for BV (P < 0.02), 48 ± 4.3 for BA (P < 0.0006), and 38.1 ± 4 for B (P < 0.0001). Rectal temperature (RT) was highest in BV (39.76 ± 0.13C) and A (39.72 ± 0.13C), compared with B (39.62 ± 0.12C), BA (39.1 ± 0.13C, P < 0.004), and BM (38.96 ± 0.12C, P < 0.0003). RT was correlated with TPT (r = 0.56, P < 0.0001) and escape velocity (EV) from the chute (r = 0.58, P < 0.0001). BM were more docile than BV (P < 0.01), A (P < 0.004), or B (P < 0.001). TPT was positively correlated with EV (r = 0.43, P < 0.003). EV differed among breeds: B = 2.21 ± 0.23 m/s; BV = 2.19 ± 0.24 m/s, P > 0.10; A = 1.68 ± 0.26 m/s, P > 0.10; BA = 1.24 ± 0.26 m/s, P < 0.0006; and BM = 1.18 ± 0.24 m/s, P < 0.0003. Breed and color influenced thermoregulation, which was in turn influenced by TPT and EV.

Key Words: Temperament, Thermoregulation, Infrared Thermography

84 Comparison of Adrenal Steroid Secretion and Plasma Metabolites in Temperate and Tropically Adapted Beef Steers. R. J. Hollenbeck^{*1}, S. T. Willard², R. D. Randel³, and T. H. Welsh¹, ¹Texas Agricultural Experiment Station, College Station, TX, ²Mississippi State University, Starkville, MS, ³Texas Agricultural Experiment Station, Overton, TX.

Variation in adrenal function, electrolyte balance, and metabolites was studied in 46 yearling steers [Angus (A), n=8; Brahman (B), n=10; Bonsmara (BM), n=10; Bonsmara x Angus (BA), n=9; Braunveigh crossbred (BV), n=9] maintained on ryegrass overseeded on Coastal bermudagrass. Average ambient temperature was 24.06 ± 0.13C, with relative humidity of 41.96 ± 0.57% and temperature-humidity index value of 69.68 ± 0.12. Blood samples were obtained by venipuncture. Plasma concentrations of cortisol (CS) and aldosterone (ALD) were determined by RIA. Electrolytes (Na⁺, K⁺, Cl⁻), plasma urea (PU), glucose (Glu), and cholesterol (Chol) were determined. B had the highest Glu (114.8 ± 6.5 mg/dL) compared to BV (93 ± 6.8 mg/dL, P < 0.02), BA (87.1 ± 6.8 mg/dL, P < 0.005), A (85.9 ± 7.2 mg/dL, P < 0.004), and BM (76.1 ± 6.5 mg/dL, P < 0.0001). B had the highest PU (24.42 ± 1.1 mg/dL) compared to BV (21.5 ± 1.2, P < 0.08), BM (21.3 ± 1.1 mg/dL, P < 0.05), BA (20.6 ± 1.2 mg/dL, P < 0.02), and A (18.1 ± 1.3 mg/dL, P < 0.0005). PU was correlated positively to Glu (r = 0.25, P < 0.08) and negatively to Cl⁻ (r = -0.35, P < 0.01). Temperate breed types A (78.5 ± 5.1 mg/dL) and BV (77.2 ± 4.8 mg/dL) had lower Chol than BA (85.7 ± 4.8 mg/dL, P < 0.004) or tropically adapted B (105.3 ± 4.5 mg/dL, P < 0.0003) or BM (105.5 ± 4.5 mg/dL, P < 0.0003). CS did not differ by breed. Na⁺ was lower in B (138.7 ± 1.1 mg/dL) than BM (141.7 ± 1.0 mg/dL, P < 0.04), BA (142.3 ± 1.1 mg/dL, P < 0.01), and BV (143.3 ± 1.1 mg/dL, P < 0.003); Na⁺ was correlated negatively with PU (r = -0.26, P < 0.07) and positively with Cl⁻ (r = 0.85, P < 0.0001). Cl⁻ was lower in B (98.2 ± 0.9 mg/dL), A (100.9 ± 1 mg/dL, P < 0.05), and BV (101 ± 1 mg/dL, P < 0.04). ALD was lower in B (82.4 ± 19.5 ng/mL) than BM (150 ± 19.5 ng/mL, P < 0.01) or A (161.6 ± 27.5, P < 0.02); ALD was correlated positively to K⁺ in BV (r = 0.66, P < 0.05), B (r = 0.43, P < 0.2), BM (r = 0.33, P < 0.3), and BA (r = 0.21, P < 0.5), and negatively in

A (r = -0.38, P < 0.5). Coat color and breed type influence electrolyte balance, aldosterone secretion, and metabolites.

Key Words: Aldosterone, Cortisol, Electrolytes

85 Influence of Steroid Implantation and Supplementation on Performance and Lactate Dehydrogenase Activity in Steers Grazing Bermudagrass. M. L. Looper^{*1}, G. E. Aiken¹, J. A. May², and C. F. Rosenkrans, Jr.², ¹USDA-Agricultural Research Service, Dale Bumpers Small Farms Research Center, Booneville, AR, ²University of Arkansas, Fayetteville.

Forty-five steers (BW = 246 ± 5.4 kg) were randomly allocated to one of three paddocks of bermudagrass [*Cynodon dactylon* (L.) Pers] to determine the effects of timing of steroid implantation and supplementation on average daily gain and lactate dehydrogenase (LDH) activity. Steers received either no supplementation or 1.4 kg/d per steer of a corn-soybean meal supplement. Steers were assigned to either no implant, one implant at d 0 and one implant at d 56 (EI), or one implant at d 56 (LI). Steers were weighed at the initiation and termination of the trial to determine weight gain and average daily gain (ADG). Blood samples were collected on d 0, 62, and 108 and LDH activity was quantified. Ultrasonography of steers was performed to determine rump fat (RF) and backfat (BF). Supplementation of steers increased (P < 0.0001) overall weight gain and ADG during 108 d of grazing (0.57 ± 0.04 vs 0.93 ± 0.05 kg/d for non-supplemented and supplemented steers, respectively). Steroid implants tended (P = 0.13) to increase overall weight gain and ADG. Implanted steers (EI and LI) had increased (P < 0.06) overall weight gain and ADG compared with non-implanted steers. Weight gain and ADG were similar (P > 0.10) between implant strategies (EI and LI). Backfat was increased (P < 0.05) in LI steers compared with EI and control steers. Both BF and RF were greatest (P < 0.05) in supplemented steers. Supplementation increased (P < 0.0001) serum protein (99.5 ± 2.6 and 117.5 ± 3.8 mg/mL for non-supplemented and supplemented steers, respectively). There was an implant x supplementation interaction (P < 0.05) for LDHR (lactate as the substrate) and LDHF (pyruvate as the substrate). The LDHR activity was decreased (P < 0.05) in non-supplemented EI steers compared with LI steers with or without supplementation, but was similar (P > 0.10) to control steers with or without supplementation. Likewise, non-supplemented EI steers had decreased (P < 0.05) LDHF compared with control and LI steers with or without supplementation. The ratio of LDHF to LDHR was influenced (P < 0.05) by implantation. Altered LDH activity may be one mechanism by which supplementation and steroid implantation improve steer performance.

Key Words: Steers, Steroids, Lactate Dehydrogenase

86 Responses of Metaphylactic Treatment with Micotil on the Incidence of Bovine Respiratory Disease (BRD) in Southeastern Stocker Cattle. R. C. Vann^{*1}, T. Engelken², B. J. Boyd¹, H. L. Evans¹, and D. McClary³, ¹Brown Loam Branch Experiment Station, Raymond, MS, ²CVM Mississippi State University, Mississippi State, MS, ³Elanco Animal Health, Greenfield, IN.

The objectives of this study were twofold: 1) to determine the effect of metaphylactic treatment with MicotilTM on bovine respiratory disease (BRD) morbidity and mortality compared to the non-medicated control steers; and 2) to monitor feed intake and body weight to determine if a reduction in the incidence of BRD affects the performance of calves during a 45-d pre-conditioning phase prior to grazing. Feeder calves (n = 239) ranging in weight from 179 to 238 kg from Southeastern US origin were assigned to a MicotilTM treatment (n = 120) group or a non-medicated control (n = 119) group. The two treatment groups were evenly distributed among twelve pre-conditioning pens (n = 20 calves per pen). Upon arrival calves were weighed, body temperature recorded, vaccinated, castrated, and administered treatment therapy. Calves were revaccinated at d 10 after processing and body weight was recorded on d 28 and 45. Calves were monitored daily for signs of clinical illness and treated according to post-processing BRD therapy guidelines. Following daily treatments, steers were returned to their original pen. At the completion of the 45-d pre-conditioning period, all steers were weighed, branded, and removed from pen assignments and allowed to graze ryegrass pasture for 107 d prior to shipment to the feedlot. Weight gain and mortality during the grazing period (107 d) were recorded. During the pre-conditioning period, the overall pull rate was greater (P <

0.05) in the non-medicated control group compared to the Micotil™ treated group (88.1 and 70.0%, respectively). The Micotil™ treated group was slightly heavier and had greater total gain and greater average daily gains ($P < 0.05$) compared to the non-medicated control group during the pre-conditioning phase. However, there were no differences between the two treatment groups in average body weight, average total gain, or average daily gain during the grazing period. Metaphylactic treatment with Micotil™ upon arrival decreased the overall pull rate of calves exhibiting signs of BRD compared to non-medicated controls in Southeastern origin stocker calves during the pre-conditioning period.

Key Words: Metaphylaxis, Stocker, Bovine Respiratory Disease

87 Incidence of Fecal Shedding of *Escherichia Coli* and *Salmonella spp.* in Beef Cattle Grazing Endophyte-Infected and Non-Infected Tall Fescue. M. L. Looper^{*1}, G. E. Aiken¹, T. S. Edrington², C. F. Rosenkrans, Jr.³, and R.O. Elder², ¹USDA-Agricultural Research Service, Dale Bumpers Small Farms Research Center, Booneville, AR, ²USDA-Agricultural Research Service, Southern Plains Ag. Research Center, College Station, TX, ³University of Arkansas, Fayetteville.

Fecal samples were obtained in replicate from mature Angus x Hereford cows ($n = 49$) and spring-born calves ($n = 45$) to determine: 1) influence of grazing endophyte-infected (E+) tall fescue (*Festuca arundinacea*) or non-infected (E-) tall fescue during the summer on shedding of *Escherichia coli* O157:H7 (EHEC) and *Salmonella spp.* (SM), 2) relationship of shedding EHEC and SM between cow and calf, and 3) influence of calf sex and steroid implant on bacteria shedding. Fecal samples were collected at 0700 on each collection date (August 5 and 26), placed on ice, and shipped to our laboratory for microbiological analyses. One-half of the calves were treated with a steroid implant at 60 d prior to fecal collection. Body temperature was measured from cattle at time of fecal collection. Mean ambient temperature and humidity at time of collection were 27.0°C and 77%, respectively. There was an endophyte x age interaction ($P < 0.0001$) for body temperature with 40.9, 40.2, 40.0, and 39.9°C (pooled SE = 0.1) for E- calves, E+ calves, E+ cows, and E- cows, respectively. Overall, incidence of EHEC shedding averaged 8.4 and 7.6% for calves and cows, respectively. *Salmonella spp.* shedding was 4.8 and 0% for calves and cows, respectively. Cows grazing E+ fescue shed less ($P < 0.05$) EHEC than cows grazing E- (1.8% vs 17% for E+ and E- cows, respectively). Likewise, EHEC shedding tended ($P = 0.11$) to be reduced in E+ calves (4.3%) compared with E- calves (13.9%). In calves, type of fescue grazed (E+ or E-) did not influence ($P > 0.10$) the incidence of SM shedding. Cow shedding of either EHEC or SM did not influence ($P > 0.10$) calf shedding of bacteria. Cow and

calf body temperature did not influence ($P > 0.10$) shedding of EHEC or SM. Shedding of EHEC and SM in calves was not influenced ($P > 0.10$) by sex of calf or implant status. Body temperature of cattle grazing tall fescue in the summer did not affect shedding incidence of either *E. coli* O157:H7 or *Salmonella spp.* In this study, mature cows grazing either E+ or E- tall fescue did not shed *Salmonella*. Shedding of *E. coli* O157:H7 tended to be reduced in calves and was decreased in cows grazing endophyte-infected tall fescue.

Key Words: Beef Cattle, Tall Fescue, *Escherichia Coli*

88 Effects of Serum Cu and Se Levels on Antibody Titers of Stocker Calves Exposed to *Leptospirios Pomona* Vaccine. H. L. Richardson*, B. C. Housewright, and D. B. Crenshaw, Texas A&M University-Commerce, Commerce, TX.

The trace mineral status of calves may be related to immune system responses to a vaccine challenge. The objective of this study was to investigate the immune response of stocker calves to inoculation of *Leptospirios pomona* vaccine in relation to their initial serum Cu and Se levels. For the immune challenge, *Leptospirios pomona* was used as a pathogen that steers should not have had previous exposure to, and after inoculation steers could be placed into a communal pasture without cross-contamination. A total of 49 stocker calves at two locations, weighing between 204 and 272 kg, were injected with *Leptospirios pomona* vaccine to determine the effects of basal serum Cu and Se levels on antibody titers. Blood samples were taken via jugular venipuncture and collected into vacuum tubes. After blood was drawn, they were inoculated intramuscularly with a 2-mL dose of a *Leptospirios* vaccine (Lepto-5; Merial Incorporated, Athens, GA). Blood samples were allowed to coagulate and were centrifuged for harvesting of serum. Serum was analyzed for Cu by atomic absorption spectrophotometry and Se by atomic absorption spectrophotometry-hydride generation. Twenty-eight days post-inoculation serum samples were analyzed for antibody titer to the vaccine. Microscopic agglutination test was used to determine antibody titers for *Leptospirios*. Data were analyzed using ANOVA in a randomized block design. There was a difference ($P < 0.05$) in titer between locations. There were no correlations between initial blood levels of Cu or Se and strength of titer to the Lepto-5 vaccine challenge. Calves used in this study had a minimum serum Se level of 20 ppb and maximum serum Se of 134 ppb, with a mean of 27.6 ± 4.0 ppb. Additionally, minimum and maximum serum Cu levels were 0.20 and 0.96 ppm, with a mean of 0.67 ± 0.02 ppm.

Key Words: Copper, Selenium, *Leptospirios Pomona*

Small Ruminant Production

89 Gastrointestinal parasitism in pasture and pen-reared lambs of three hair sheep breeds in the southeastern U.S. S. Wildeus^{*1}, J. E. Miller², and J. R. Collins¹, ¹Virginia State University, Petersburg, VA, ²Louisiana State University, Baton Rouge, LA.

December-born lambs representing the Barbados Blackbelly, Katahdin, and St. Croix hair sheep breeds (6 ewes and 6 wethers each/breed) were allocated to the experiment in May. Lambs were allocated equally to either a pasture or pen feeding group stratified by breed and sex. Pasture animals were maintained as one group on a native, fescue-based sward (1.5 ha), subdivided into 3 units for rotational grazing. Pen animals were allocated equally to 6 pens and fed chopped alfalfa hay *ad lib*. Both groups were supplemented with a corn/soybean mixture at 0.75% of BW. All animals were dewormed (moxystectin) two weeks after the onset of the trial, but were not re-treated for the remainder of the experiment. Fecal egg counts (FEC) and packed cell volume (PCV) were recorded in 14-d intervals throughout the trial. At the end of the grazing season (168 d on trial) animals were slaughtered and intestinal tracts recovered and processed for the determination of total worm burden. FEC and worm counts were analyzed after log conversion to determine effects of breed, treatment (pen vs. pasture), and sex. FECs were higher in Barbados Blackbelly on pasture than any other breed by treatment combination (478 vs. 136 eggs/g; interaction $P < .05$). PCV was higher ($P < .01$) in Barbados Blackbelly (33.9%) than the other two breeds (31.6%) and higher ($P < .01$) in pen (34.5%) than on pasture (30.4%). Abomasal counts of *Haemonchus contortus* tended to

be lower ($P < .1$) in St. Croix (115) than Barbados Blackbelly (451) and Katahdin (316), but were not different between pasture and pen. Worm counts in the small intestine were higher ($P < .01$) in pasture (413) than pen (154), and tended to be lower ($P < .05$) in Barbados Blackbelly (139) and St. Croix (144), than in Katahdin (568). St. Croix appeared to have a lower overall parasite load than the other breeds and no animal showed clinical signs of parasitism during the experiment.

Key Words: Hair Sheep, Parasites, Pasture

90 Direct effects of condensed tannins on gastrointestinal nematodes in grazing Angora goats. B.R. Min*, D. Miller, S.P. Hart, G. Tomita, E. Loetz, and T. Sahlu, *E. Kika (de la Garza Institute for Goat Research, Langston University, Langston, OK.*

The objective of this study was to evaluate effects of condensed tannin-containing forage, Serica lespedeza (SL; 5.2% condensed tannins (CT)) on fecal egg count (FEC; eggs/g of feces), rate of larva development (RLD; larvae/10 g of feces), adult worm burden (AWB), and immune response (IMR) compared with a control forage (CF; crabgrass/tall fescue; 0.2% CT) in grazing Angora does and kids. Fifty worm-free does were randomly allocated to three treatments. One treatment (10 does; 45 ± 1.5 kg) was grazed on SL forage from April 25 to July 15, 2002 (81 d), and second treatment (20 does; 43 ± 1.4 kg) grazed CF. A third treatment (20 does; 44 ± 1.4 kg) was introduced to a sward of SL for 2 wk and then was switched to CF for 2 wk (MIX), followed by repeated