

**ABSTRACTS**  
**2004 ASAS Southern Meeting**  
**February 14-18 2004**  
**\* Author Presenting Paper**

**Pasture and Forages I**  
**(Previously Animal Science/Forages Joint Session)**

**1 Invited Paper: Designing supplements for stocker cattle grazing wheat pasture.** G. W. Horn\*, *Oklahoma State University, Stillwater.*

Abstract not available.

**2 Influence of forage blend and cultivation method on cool season forage availability for beef cattle grazing.** R. O. Myer\* and A. R. Blount, *University of Florida.*

A 2 year, 2 x 2 study was conducted to evaluate two forage blends (small grains without vs. small grains with ryegrass) and two cultivation methods (prepared seedbed (PS) vs overseeding (OS)) of cool season forage for grazing by growing beef cattle. Eight, 1.33 ha paddocks were utilized during the 2001-02 and 2002-03 winter grazing seasons. Four paddocks for PS each year were prepared for planting by deep plowing followed by disc harrowing. Four paddocks for OS for each year were in permanent bahiagrass pasture (*Paspalum notatum* Flugge) and were overseeded using a no-till seed drill. Within cultivation method, two paddocks were planted to small grains (mix of rye (*Secale cereale* L.) and oats (*Avena sativa* L.)) (RO) and two to small grains plus annual ryegrass (*Lolium multiflorum* Lam) (RORG). The RO-PS paddocks were planted in early Oct and the RORG-PS paddocks, late Oct of each year. The OS paddocks were planted in mid Nov of each year when bahiagrass became dormant. Upon sufficient forage, the paddocks were grazed by growing beef steers and heifers with an average initial weight of 257 and 262 kg for yr 1 and 2, respectively. Each paddock was grazed by four tester animals (2 S, 2 H) and put and take cattle were added as necessary. The grazing season ended late Apr in 02 and late May in 03. The avg number of animal grazing days/ha/yr was 561, 530, 302, and 310 for the PS-RO, PS-RORG, OS-RO, and OS-RORG treatments, respectively (SE=18). Average forage DM yield (kg/ha/yr) was 5196, 5542, 3888, and 3389 (SE = 557); avg daily gain (kg/d) of tester cattle was 1.10, 1.02, 0.90, and 0.90 (SE = 0.04); and avg total estimated gain (kg/ha/yr) was 623, 542, 270, and 281 (SE=32), for the above treatments, respectively.

Cultivation method, but not forage blend, affected ( $P < 0.01$ ) the number of animal grazing days and total gain/ha over the two year study. The results indicate that under dryland conditions, cultivation method may have a large impact on available forage for cool season grazing by growing beef cattle in the southern coastal plain region of the USA.

**Key Words:** Pasture, Cool Season Forages, Beef Cattle

**3 Evaluation of cool-season annual grasses interseeded into bermudagrass sod for growing cattle.** P. A. Beck\*, S. A. Gunter, C. B. Stewart, and J. M. Phillips, *University of Arkansas, Southwest Research and Extension Center.*

To evaluate the effect of species of cool-season annual grass on the growth of stocker calves, combinations of small grains or small grains and annual ryegrass were interseeded into bermudagrass sod from 21 to 30 October 2002. Twenty-four 0.81-ha bermudagrass pastures were seeded, two pastures were deleted from the experiment due to inadequate stand establishment. Oats (variety not stated, O), Wintergrazer 70 rye (R), or ARLA 85411 wheat (W) were planted individually at 134.4 kg/ha or with 22.4 kg/ha Marshall annual ryegrass (RG). Grazing was initiated when adequate forage was accumulated to support three calves (2 heifers and 1 steer with an average BW =  $212 \pm 5.1$  kg) per pasture (1.68 calves/ha) on December 18. Grazing was managed using the put-and-take method, where the three original calves were used as tester animals to measure performance, additional calves were added as needed to maintain equal grazing pressure among pastures. The pastures were fertilized with 336 kg 17-17-17 in the fall and 168 kg ammonium nitrate in the spring. The calves were fed 0.91 kg/d of an energy supplement designed to supply 200 mg of lasalocid. Data were analyzed as a completely random design using the GLM procedure of SAS. Least-square means were separated using contrasts to determine the differences among the small grains and to determine the effect of RG addition to the small grains. There were no differences in individual animal ADG ( $P > 0.10$ ) with calves gaining an average of 0.48 kg/d during the winter grazing

period and 1.15 kg/d during the spring grazing period. The addition of RG increased the number of animal grazing-d/ha by an average of 83.3 d ( $P < 0.01$ ) and gain/ha was increased by 148.3 kg. Planting W and WRG increased ( $P = 0.05$ ) gain per ha by 83.2 kg compared to the average of the other treatments. Using O or ORG tended ( $P = 0.08$ ) to produce 76.8 kg less gain/ha than the average of the other treatments. In conclusion, W is superior to other small grains and RG is a necessary addition when interseeding cool-season annuals into bermudagrass sod.

**Key Words:** Beef cattle, Grazing, Cool season

#### **4 Effect of planting date and stocking rate on growth performance of cattle and grain yield in a dual-purpose winter wheat system.** B. G. Fieser\*, G. W. Horn, E. G. Krenzer, and F. M. Eplin, *Oklahoma Agricultural Experiment Station, Stillwater.*

This experiment was conducted during the winter of 2002-03 to evaluate the effect of planting date and forage allowance on cattle performance and grain production in a dual-purpose winter wheat system. One hundred sixty-two crossbred steers (initial BW =  $236 \pm 6$  kg) and sixteen clean tilled wheat pastures were used in a completely randomized design. Steers were stratified by initial weight and randomly assigned to four initial stocking rates within an early or late planting date. Average forage allowances ranged from 217 to 980 kg DM/100 kg BW for early-planted wheat, and 162 to 709 kg DM/100 kg BW for late-planted wheat. Early planting provided 24 more grazing days than late planting, 120 vs. 96. Average daily gain, overall steer gain, and grain yield all responded in a quadratic ( $P \leq 0.06$ ) manner, peaking around a forage allowance of 700 kg DM/100 kg BW. All cattle performance parameters were greater ( $P < 0.01$ ) for early- than late-planted wheat. Daily gains of steers grazing early-planted wheat ranged from 1.02 to 1.21 kg, compared with 0.81 to 0.98 kg for late-planted wheat. Overall steer gains on early-planted wheat ranged from 123 to 145 kg, compared with 78 to 94 kg on late-planted wheat. Gains per hectare also responded in a quadratic ( $P = 0.02$ ) manner, peaking at the lowest forage allowance and decreasing as forage allowance increased for both planting dates. Steers grazing early-planted wheat gained between 121 and 257 kg/ha. Gains per hectare on late-planted wheat followed a similar pattern and ranged from 165 to 94 kg. Grain yields were greater ( $P < 0.01$ ) for late-planted wheat (2771 to 3921 kg/ha), compared to early-planted wheat (2367 to 3027 kg/ha). These data indicate that under excellent conditions cattle performance can be substantially improved by early planting. However, in a dual-purpose winter wheat system this advantage is partially offset by a subsequent reduction in grain yield.

**Key Words:** Wheat Pasture, Forage Allowance, Steer Gain

#### **5 Invited Paper: Potential of seeded bermudagrasses for forage and animal production.** L. Redmon\*, *Texas A&M University, Overton.*

Abstract not available.

#### **6 Tall fescue vs. small grains as components of year-round stocker grazing systems.** K. S. Lusby\*, S. A. Gunter, and D. S. Hubbell, III, *Division of Agriculture, University of Arkansas.*

The objective of this study was to determine if stocker calves backgrounded on endophyte-infected tall fescue compared to small grains forages could achieve sufficient compensatory growth during subsequent grazing of small grains in the spring or bermudagrass in the summer to offset anticipated compromised performance for fescue. Studies were conducted at the Livestock and Forestry Branch Station near Batesville, AR. Established pastures of Kentucky-31 fescue (90% endophyte infection) were compared to clean-tilled wheat and rye (67 kg/ha of each planted as a mixture in September). Forty medium- to large framed steers in 2002 and 32 in 2003, weighing 202 to 230 kg grazed 1.6-ha replicates of fescue or wheat/rye pasture with four calves each from March 13 to May 8 and then grazed a single 16-ha pasture of common bermudagrass until August 15. Calves that grazed small grains during the spring graze out period, gained more BW than calves that grazed fescue in 2002 and 2003 (67 vs. 25 kg,  $P < 0.01$  and 54 vs. 30 kg,  $P < 0.01$ , respectively). However, no compensatory gain was seen while grazing bermudagrass when BW gains for calves previously grazing fescue compared to small grains were 90 vs. 85 kg in 2002 and 66 vs. 68 kg in

2003. Similarly, 48 steers (225 kg) were backgrounded on either fescue or wheat/rye pastures from 21 November 2002 to 31 January 2003 and then grazed on wheat/rye pastures until April 22. Calves backgrounded on small-grains gained more BW (59 vs. 36 kg,  $P < 0.01$ ) than calves backgrounded on fescue. However, BW gain during subsequent grazing on small grains was similar for calves previously grazing fescue or wheat/rye (97 vs. 95 kg, respectively). Despite significantly greater BW gains when calves grazed small grains forages during the winter or spring, no compensatory gain was seen when calves were subsequently grazed on small grains in the spring or bermudagrass in summer.

**Key Words:** Compensatory Gain, Fescue, Small Grains

#### **7 Cool-season annual pasture with legumes to supplement wintering beef cows.** W. A. Whitworth<sup>1</sup>, T. G. Montgomery<sup>1</sup>, and S. A. Gunter<sup>2</sup>, <sup>1</sup>*University of Arkansas SEREC, Monticello,* <sup>2</sup>*University of Arkansas SWREC, Hope.*

On January 10, 2003, 60 beef cows ( $588 \pm 10$  kg  $\pm$  SE; fall calving; starting 9 September 2002) were divided into six groups stratified by breed, body condition score, BW, and age into one of six annual forage swards (0.45 ha/cow) interseeded into dormant bermudagrass/dallisgrass pastures. Treatments applied to cow groups were as follows: all groups had ad libitum access to hay (12%CP; 58% TDN), plus 1) wheat and ryegrass (WRG; control group), 2) grazing wheat and ryegrass plus red clover (WRR), or 3) grazing 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 using CIDR inserts, and were subsequently inseminated to a Beefmaster sire on observed estrus. On January 10, a bull 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 body condition score did not differ ( $P > 0.30$ ) between cows grazing WRG and the average of WRR and WRW; although cow BW in both January and March ( $P = 0.09$  and  $P = 0.11$ , respectively) tended to be greater for cows grazing WRR than cows grazing WRW. Calf birth weights did not differ in either contrast ( $P = 0.43$  and  $P = 0.74$ , respectively). There were no differences between WRG and the average of WRR and WRW for calf BW or ADG on any date ( $P \geq 0.29$ ). Additionally, there were no differences in calf BW and ADG for the clover treatments ( $P \geq 0.57$ ) on any date. All supplemental treatments were effective in maintaining cow BW and body condition score throughout the winter and spring months, there seemed to be no beneficial effects associated with additions of clover to the swards on animal performance.

**Key Words:** Beef Cows, Legumes, Pastures

#### **8 Assessment of a modified Merrill grazing system in south Texas.** K. K. Porter\*, J. A. Ortega-S., S. D. Lukefahr, and R. L. Stanko, *Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville.*

Grazing systems have been shown to be scientifically valid and practical to improve productivity of livestock and range. The Merrill grazing system is a modification of rotational deferment consisting of a three-herd, four-paddock grazing scheme. Over a 4-YR grazing system cycle, pastures are subjected to yearlong continuous grazing and periodic deferment. Two modified Merrill (MM) grazing systems (MM1=27,623 acres; MM2=26,326 acres) were evaluated for similarity index, plant diversity, and herbaceous vegetation cover at 0 and 40 mo of implementation on the King Ranch. Pregnancy rate of fall-calving, crossbred cows managed in a yearlong continuous ( $n = 2,939$ ) or the two MM grazing systems ( $n = 2,525$ ) were compared during a 4-YR period concurrent with range evaluation. Pregnancy rate was determined by rectal palpation. Stocking rates for the yearlong continuous and the two MM grazing systems were 1 au:12 to 37 acres and 1 au:14 to 34 acres, respectively. Changes in similarity index, plant diversity, and herbaceous vegetation cover in the two MM grazing systems were evaluated by using a minimum of 6 fixed transects per paddock allowing for the use of the step point method giving 100 readings per transect. From initial (0 mo) to 40 mo evaluation, similarity index increased ( $P < 0.06$ ) from 16 to 21% in MM1, but not in MM2 (20 vs. 21%,  $P > 0.10$ ). Plant diversity increased in both MM1 and MM2 (73 to 84 and 64 to 73 species, respectively). Herbaceous vegetation cover did not vary ( $P > 0.10$ ) for MM1 (33 vs.

39%) or MM2 (37 vs. 40%). Pregnancy rate did not differ ( $P > 0.05$ ) in YR 1, 3, and 4 between grazing systems, but was greater ( $P < 0.001$ ) during YR 2 in the MM1 and MM2 (92%) compared to yearlong continuous grazing (85%). Annual rainfall (LSMEAN, cm) was influenced ( $P < 0.01$ ) by YR, with YR 2 having the least rainfall among the 4 YR (YR 1 = 80.75, YR 2 = 47.65, YR 3 = 60.45, YR 4 = 64.85). The implementation of a MM grazing system in south Texas may contribute to increased plant species diversity, range condition, and cow reproduction performance, especially during dry years.

**Key Words:** Grazing, Range, Cattle

## 9 Invited Paper: Recent advances in legumes for grazing livestock production. J. G. Andrae\*, *University of Georgia, Athens.*

Abstract not available.

## 10 Evaluation of forage production and quality of triticale cultivars. M. Lema and E. Cebert, <sup>1</sup>*Tennessee State University,* <sup>2</sup>*Alabama A & M University.*

Because of its cold tolerance and double-cropping potential, triticale can play an important role in bridging the feed shortage gap in late fall and winter in the south eastern United States when other cool season grasses become dormant. Field trials were conducted in 2001 and 2002 at Winfred Thomas Agricultural Research Station (WTARS) and Sand Mountain Agricultural Substation (SMAS) in north Alabama to evaluate the forage yield and quality of six triticale (*X Triticosecale Wittmack*) cultivars (TCL105, TCL111, TX98D955, TX96VT5019, Tritical 498 and Tritical 2700). The cultivars were planted in four replicated 6-row plots 6.1 m long with rows 1.22 m apart in a randomized complete block design. At both locations, TX98D955, TX96VT5019 and Tritical 2700 produced higher ( $P < 0.05$ ) forage DM than the other cultivars (2-yr average of 4,134; 3,851 and 4,063 kg/ha for TX98D955, TX96VT5019 and Tritical 2700, respectively versus 2,744; 3,070 and 3,077 kg/ha for TCL105, TCL111 and Tritical 498, respectively at WTARS and 6,326; 5,974 and 5,938 kg/ha for TX98D955, TX96VT5019 and Tritical 2700, respectively versus 4,531; 3,784 and 4,060 kg/ha for TCL105, TCL111 and Tritical 498, respectively at SMAS). Crude protein, ether extract and gross energy contents were lower ( $P < 0.05$ ) for TCL111 and TCL105. Acid-detergent fiber content was higher ( $P < 0.05$ ) and IVDMD lower ( $P < 0.05$ ) for TCL 105. The cultivars TX96VT5019 and TX98D955 had higher ( $P < 0.05$ ) P content and the cultivars TCL105, TCL111, TX96VT5019 and TX98D955 higher ( $P < 0.05$ ) Ca content than the rest. The cultivars TCL105 and TCL111 were higher ( $P < 0.05$ ) in Mg and lower ( $P < 0.05$ ) in K than the other cultivars. Sulfur was higher ( $P < 0.05$ ) for Tritical 498 and Zn higher ( $P < 0.05$ ) for TCL498, TX96VT5019 and TX98D955. Iron content was lower ( $P < 0.05$ ) for TX96VT5019 and TX98D955 than for the other cultivars.

**Key Words:** Triticale Cultivars, Forage Production, Forage Quality

## 11 Effects of supplementing soybean meal, corn or soybean hulls to steers consuming rice straw on *in vivo* digestibility. V. T. Nguyen\*, B. J. Rude, and D. G. St. Louis, *Mississippi State University.*

To test the effects of supplementation strategy on beef cattle fed rice straw (RS), one trial was conducted from 02/01/03 to 5/25/03. Four ruminally fistulated steers ( $235 \pm 18.9$  kg) were assigned in a 4X4 latin square design with 4 treatments: RS alone (Control); RS and soybean meal (SBM) at 0.127 % BW; RS and corn (Corn) at 0.415 % BW or RS and soybean hulls (Hulls) at 0.415 % BW. Each period included a 14-d adaptation followed by 10-d data collection. Steers were offered respective supplements at 0800 and a free access to RS. Straw DM intake was not different among treatments ( $P = 0.2875$ ), but total DM intake (% BW) was significantly less ( $P = 0.0134$ ) for Control (1.3 %) compared to any supplement treatment (1.7, 1.7, and 1.8 % for SBM, Corn and Hulls, respectively). Straw OM intake did not differ ( $P = 0.3068$ ) among Control, SBM, Corn and Hulls (1.1, 1.3, 1.1 and 1.1 % BW, respectively). Total OM intake of supplemented animals was greater (1.5, 1.5 and 1.6 % BW for SBM, Corn and Hulls, respectively;  $P < 0.05$ ) than control (1.1 % BW). There were significant differences of DM digestibility ( $P < 0.05$ ) with the greatest values for Hulls and Corn (60 and 57 %, respectively), followed by SBM (52 %) and the least

for Control (44 %). Organic matter digestibility was least for Control (50 %) and greatest for Hulls (65 %) with SBM (58 %) and Corn (62 %) being intermediate ( $P < 0.05$ ). Digestibility of NDF for Control (43 %) and SBM (49 %) were less ( $P < 0.05$ ) than Corn (58 %) and Hulls (59 %). Digestibility of ADF for Hulls (60 %) was greater ( $P < 0.01$ ) than for Corn (49 %) and both were greater ( $P < 0.01$ ) than Control (42 %) and SBM (44 %). Protein digestibility was greatest for SBM (60 %) and least for Control (11 %) with Hulls (49 %) and Corn (41 %) being intermediate ( $P < 0.01$ ). Supplementing soybean meal, corn or soybean hulls increased DM, OM, fiber and CP digestibility by steers consuming RS. Corn and soybean hulls supplementation to RS enhanced fiber digestion compared to control or soybean meal supplemented steers. Compared to corn, soybean hull supplementation was more effective for enhancing OM and ADF digestibility.

**Key Words:** Rice Straw, Supplementation, *In Vivo* Digestibility

## 12 Effects of supplementing soybean meal, corn or soybean hulls to steers consuming rice straw on *in situ* disappearance of rice straw DM and rumen environment. V. T. Nguyen\*, B. J. Rude, and D. G. St. Louis, *Mississippi State University.*

Four ruminally cannulated steers ( $235 \pm 18.9$  kg) were used in a 4X4 latin square trial to test the effects of supplementing soybean meal, corn or soybean hulls to rice straw (RS) on *in situ* disappearance of dietary nutrients and changes in the rumen environment. The trial had 4 treatments: RS alone (Control); RS and soybean meal at 0.127 % BW (SBM); RS and corn at 0.415 % BW (Corn) or RS and soybean hulls at 0.415 % BW (Hulls). Each period included a 14-d adaptation followed by 10-d data collection. Rumen fluid samples were collected at 0, 2, 4, 6 and 8 h post-feeding on the 5th day of the collection period and an *in situ* trial was conducted on the 2 last days of each period. Rate of rice straw DM disappearance *in situ* for Control (0.0292 g/hr) was slower ( $P < 0.05$ ) than for steers receiving supplement, which were not differed among themselves ( $P > 0.05$ ; 0.0390, 0.0386 and 0.0478 g/hr, for Corn, Hulls and SBM, respectively). Soybean hulls had the fastest disappearance rate (0.136 g/hr), followed by soybean meal (0.112 g/hr) and corn was the slowest (0.081 g/hr;  $P < 0.01$ ). Rumen pH (ranged from 5.89 to 6.63) and was not different among treatments ( $P > 0.5$ ), nor among time points ( $P > 0.05$ ). Total rumen VFA contents were similar among treatments at hour 0 and 2 ( $P = 0.90$  and 0.53, respectively). At hour 4, Hulls had a greater ( $P < 0.05$ ) total VFA concentration (230 mmol) than SBM and RS (164 and 156 mmol). Total VFA at hour 6 was greater for Hulls (241 mmol;  $P < 0.05$ ) than for RS (158 mmol), but was similar to Corn (189 mmol) and SBM (181 mmol). Rumen  $\text{NH}_3$  content of steers receiving Control (ranged from 11.7 to 25.3 mg/l) and was less ( $P < 0.05$ ) than those on Hulls and SBM at all time points. Hulls and SBM had similar ( $P > 0.05$ ) values for  $\text{NH}_3$  (between 82.3 and 282.2 mg/l for Hulls and between 120.1 and 301.0 mg/l for SBM), and both greater ( $P < 0.05$ ) than for Corn (between 42.6 and 132.7 mg/l). Soybean meal, soybean hulls and corn supplementation enhanced *in situ* disappearance of rice straw DM, increased rumen VFA and  $\text{NH}_3$  concentration and supportively affected rumen environment.

**Key Words:** Rice Straw, Supplementation, *In Situ* Digestion

## 13 Invited Paper: The role of crabgrass in southern forages systems. R. Reuter\*, *Noble Foundation, Ardmore, Oklahoma.*

Abstract not available.

## 14 Fiber composition and NDF degradation kinetics of crabgrass harvested on seven dates in northern Arkansas. R. K. Ogden\*, W. K. Coblenz, K. P. Coffey, J. E. Turner, D. A. Scarbrough, J. A. Jennings, and M. D. Richardson, *University of Arkansas.*

Common crabgrass [*Digitaria ciliaris* (Retz.) Koel.] is undesirable in fields of bermudagrass [*Cynodon dactylon* (L.) Pers.] because it dries slowly, and can cause spontaneous heating and molding in hay. However, visual observation suggests that livestock often prefer crabgrass to other summer forages. Our objectives were to assess the nutritive value of whole-plant crabgrass harvested at weekly intervals over seven dates (11 July through 22 August 2001), and to determine the characteristics of *in-situ* disappearance of neutral detergent fiber (NDF) for these forages. Alfalfa (*Medicago sativa* L.), bermudagrass, and orchardgrass (*Dactylis*

*glomerata* L.) were evaluated simultaneously as diverse controls. In general, concentrations of NDF, acid detergent fiber, hemicellulose, cellulose and lignin in whole-plant crabgrass increased over sampling dates, but concentrations of N declined from 3.36 to 2.55% during the same time interval. Crabgrass forages and controls were evaluated for in-situ disappearance of NDF in five (383 ± 22.7-kg) ruminally cannulated crossbred steers. Crabgrass overall (mean = 0.078/h) exhibited a more rapid ( $P < 0.0001$ ) NDF disappearance rate than bermudagrass (0.057/h) and orchardgrass (0.059/h) hays, but a slower disappearance rate than alfalfa (0.107/h;  $P < 0.0001$ ). The effective ruminal degradability of NDF was greater ( $P \leq 0.004$ ) for crabgrass (mean = 60.6%) than alfalfa (37.6%), orchardgrass (57.6%), and bermudagrass (59.3%). Over the 11, 18, and 25 July harvest dates, the effective NDF degradability of crabgrass was 0.9 to 5.5 percentage units greater than observed for bermudagrass. In addition, the effective degradability of NDF remained comparable to bermudagrass throughout four August harvest dates. These results indicate that crabgrass exhibits lower concentrations of NDF and improved ruminal fiber digestibility compared to bermudagrass and should therefore support greater animal performance.

**Key Words:** Crabgrass, Fiber, Degradation

**15 Effects of diet on performance, reproduction, and economics of market cows grazing stockpiled fescue.** M. L. Loofer\*<sup>1</sup>, G. E. Aiken<sup>2</sup>, R. Flores<sup>3</sup>, and C. F. Rosenkrans, Jr.<sup>3</sup>, <sup>1</sup>USDA-ARS, Dale Bumpers Small Farms Research Center, Booneville, AR, <sup>2</sup>USDA-ARS, Forage and Animal Production Research Unit, Lexington, KY, <sup>3</sup>University of Arkansas, Fayetteville, AR.

Forty-two crossbred, nonpregnant cows (mean age = 4.3 ± 0.2 yr) were purchased from local auction barns to determine the effect of diet on

performance, reproduction, and economics of market cows grazing stockpiled, endophyte-infected fescue (*Festuca arundinacea*). Cows were assigned to one of three replicated paddocks of stockpiled fescue for 160 d and fed diets of either soyhulls (SH), corn:soybean meal (CSB), or not supplemented (control) at 0.91 kg/d. Feed cost was \$0.13/kg for soyhulls and \$0.18/kg for the corn:soybean meal ration. Cows were exposed to bulls and palpated for pregnancy. Cows were weighed and body condition scored (BCS) every month. Cows weighed 395 ± 6 kg and a BCS of 4.3 ± 0.1 at the initiation of the study. Mean purchase price was \$385/cow (\$0.97/kg). At the termination of the experiment, cows were sold at local auction. Diet did not alter ( $P > 0.10$ ) ADG of cows. Control cows gained 0.55 kg/d while CSB and SH cows averaged 0.61 and 0.63 kg/d, respectively. Change in body condition tended ( $P = 0.08$ ) to be greater for SH cows (1.8 ± 0.2 units increase) than CSB and control cows (mean = 1.3 ± 0.2 units change). Reproductive performance was not different ( $P > 0.10$ ) across nutritional treatments. Ninety percent of all cows were pregnant at the end of the grazing period. At selling, SH cows tended ( $P = 0.06$ ) to have increased weight (515.9 ± 13.6 kg) compared with CSB cows (486.4 ± 13.6 kg) and control cows (472.7 ± 11.4 kg). Selling price of cows was not different ( $P > 0.10$ ) and averaged \$638, \$612, and \$597 for CSB, SH and control cows, respectively. Feed costs were \$19.32/cow for SH cows and \$25.76/cow for CSB cows. Average income over purchase price and feed costs was similar among nutritional treatments ( $P > 0.10$ ) and was \$227 for CSB cows, \$212 for control cows, and \$208 for SH cows. With increased feed costs, supplementation of market cows grazing stockpiled fescue may not increase profitability.

**Key Words:** Beef Cows, Stockpiled Fescue, Economics

## Breeding and Genetics

**16 Influence of the sex-linked feathering locus on performance and carcass traits of broiler breeder chickens.** S. N. Nahashon\*<sup>1</sup>, J. Bartlett<sup>3</sup>, and E. J. Smith<sup>2</sup>, <sup>1</sup>Institute of Agricultural and Environmental Research, Tennessee State University, <sup>2</sup>Department of Animal and Poultry Science, Virginia Polytechnic and State University, <sup>3</sup>Department of Agricultural Sciences, Tuskegee University.

Reports on the influence of sex-linked rate of feathering on growth and carcass traits are few, varied and inconclusive. In the present work, chicks of both sexes from a cross of heterozygous K/k+ (slow feathering) males and k+/W (rapid feathering) females were assigned to starter and grower diets from hatch to 3 weeks of age (WOA) and 4 to 8 WOA, respectively. In individual floor pens which were replicated three times, performance and carcass traits of 126 males of each genotype (K/k+ and k+/k+) and 126 females of each genotype (K/W and k+/W) were evaluated. Feed consumption (FC), body weight gain (BWG) and feed conversion ratio (weight of feed consumed divided by BWG) were measured weekly. The weights of carcass, abdominal fat, pancreas, heart, spleen, gizzard, liver, proventriculus and small intestine were determined at 8 WOA. Average FC, BWG and feed conversion ratio (FCR) increased linearly with age and were greater ( $P < .05$ ) for birds of the slow-feathering genotypes (K/k+ or K/W) than the rapid-feathering genotypes (k+/k+ or k+/W). Mean carcass, heart and liver weight were also significantly higher ( $P < .05$ ) in slow-feathering birds of either sex than their rapid-feathering counterparts. However, mean pancreatic weights of rapid-feathering males and slow-feathering females were greater ( $P < .05$ ) than for their slow- and rapid-feathering counterparts, respectively. While spleen weights were not significantly different between slow- and rapid-feathering males, slow-feathering females exhibited higher ( $P < .05$ ) spleen weight than rapid-feathering females. This study suggests higher ( $P < .05$ ) BWG, FCR, carcass, liver and heart weight in slow- than rapid-feathering chickens.

**Key Words:** Feathering Genotype, Carcass Traits, Performance of Chickens

**17 Evaluation of Romosinuano as straightbreds and crossbreds with Angus and Brahman: Prewaning calf traits.** D. G. Riley\*<sup>1</sup>, C. C. Chase, Jr.<sup>1</sup>, S. W. Coleman<sup>1</sup>, and T. A. Olson<sup>2</sup>, <sup>1</sup>USDA, ARS, STARS, <sup>2</sup>Univ. Florida.

The objective was to evaluate Romosinuano for calf performance traits. Calves (n = 708, born in 2002 and 2003) were Romosinuano (R), Angus (A), and Brahman (B) or crossbreds (RB, BR, RA, AR, BA, AB; letters indicate breed of sire and dam, respectively). Birth and weaning weight, hip height and body condition score at weaning (1 to 9) were analyzed with models that included breed group, year, dam age, dam winter nutritional regime (n = 2), and calf sex as fixed effects. Calf age in days at weaning was included as a continuous variable. Sire within breed was a random term. Heterosis was significant for birth weight for A with R (5.7%, 1.68 ± 0.61 kg), A with B (9.8%, 2.98 ± 0.67 kg), and R with B (7.8%, 2.39 ± 0.61 kg). Birth weight direct effects for A, B, and R were 4.11 ± 0.94, 6.99 ± 1.02, and 2.88 ± 1.02 kg, respectively, and maternal effects were 1.57 ± 0.66, 5.32 ± 0.67, 3.75 ± 0.62 kg, respectively ( $P < 0.001$ ). F<sub>1</sub> calves (BA and BR) were 4.69 ± 0.99 kg and 5.95 ± 0.9 kg heavier than the respective reciprocal crosses ( $P < 0.001$ ). Heterosis for weaning weight ranged from 11.6 ± 3.59 kg (5.6%, A with R) to 22.1 ± 4.02 kg (9.94%, A with B). Weaning weight direct effects were significant for B (13.08 ± 6.02 kg) and R (21.62 ± 5.5 kg); maternal effects were significant for A (23.02 ± 3.86 kg) and B (16.02 ± 3.96 kg). Heterosis for hip height was 1.44 ± 0.68, 1.98 ± 0.7, and 2.44 ± 0.77 cm, respectively, for R with A (1.3%), R with B (1.7%), and B with A (2.1%). Direct effects were significant for A and B (5.53 ± 1.15 cm, 6.42 ± 1.16 cm, respectively). Maternal effects on hip height were significant for A, B, and R (4.27 ± 0.73, 2.5 ± 0.76, and 1.77 ± 0.7 cm, respectively). Heterosis for body condition score was significant for B with R (3.3%, 0.19 ± 0.04) and for A with B (2.1%, 0.13 ± 0.05). Brahman maternal effects for body condition score (0.12 ± 0.07) were significant. Romosinuano germplasm may be best utilized as crosses, especially with Brahman, for early calf performance.

**Key Words:** Breed Differences, Heterosis, Romosinuano

**18 Evaluation of Romosinuano as straightbreds and crossbreds with Angus and Brahman: Stocker and feedlot gains.** W. A. Phillips<sup>1</sup>, S. W. Coleman<sup>2</sup>, D. G. Riley<sup>2</sup>, C. C. Chase, Jr.<sup>2</sup>, and H. S. Mayeux<sup>1</sup>, <sup>1</sup>USDA-ARS Grazinglands Research Laboratory, El Reno, OK, <sup>2</sup>USDA-ARS Subtropical Agricultural Research Station, Brooksville, FL.

Genetic adaptation to tropical conditions is an essential component of beef herds in the Southern US. Calves generated from these herds are transported to more temperate climates for growth and development. The objective of this experiment was to compare stocker and feedlot performance of steers from temperate (Angus) and tropical (Brahman and Romosinuano) breeds reared in a semitropical environment, but grown and finished in a temperate environment. In the fall of 2002, steer calves (n=143) of Angus (A), Brahman (B), Romosinuano (R), and all two breed crosses (AB, AR, BA, BR, RA, and RB; letters indicate breed of calf's sire and dam, respectively) born and reared at Brooksville, FL were transported 2025 km to El Reno, OK. Steers grazed winter wheat pastures from November 13 through May 6 before entering the feedlot. At the beginning of the grazing period (SWT), purebred R and A calves were lighter (P < 0.05) than purebred B and crossbred calves. Rate of gain (WADG) during the winter grazing period (November through Mid-March) was lower (P < 0.05) for purebred B and R calves than for purebred A calves with crossbred calves being intermediate. Rate of gain (SADG) during the spring (March and April) followed a similar trend among breeds to those observed during the winter. During the feedlot phase, calves were fed for an average of 123 d. Feedlot ADG (FLADG) of purebred R, B and A calves was lower (P < 0.05) than FLADG for crossbred calves with the exception of RA and RB calves. In general, crossbred calves had higher (P < 0.05) final feedlot BW (FLFBW) than purebred calves. Purebred R and B calves had similar stocker and feedlot performance, but RA calves performed better than RB calves. The Romosinuano breed can be effectively used in crossing breeding programs to produce stocker and feeder calves for use in the southern great plains.

Breed	SWT	WADG	SADG	FLADG	FLFBW
AA	229	0.95	1.25	1.06	549
BB	247	0.58	1.06	0.97	498
RR	212	0.71	1.09	1.08	490
AB	276	0.79	1.29	1.13	583
AR	255	0.83	1.28	1.17	569
BA	266	0.90	1.27	1.33	602
BR	256	0.78	1.20	1.36	581
RA	249	0.85	1.22	1.07	548
RB	233	0.62	1.14	0.77	459
SE	10	0.05	0.06	0.08	14

**Key Words:** Tropical Breed, Winter Wheat, Stocker

**19 Evaluation of Romosinuano as straightbreds and crossbreds with Angus and Brahman: carcass traits.** S. W. Coleman<sup>1</sup>, D. G. Riley<sup>1</sup>, C. C. Chase, Jr.<sup>1</sup>, W. A. Phillips<sup>2</sup>, W. J. Horne<sup>3</sup>, and J. H. Byrd<sup>3</sup>, <sup>1</sup>USDA, ARS, SubTropical Agricultural Research Station, Brooksville, FL, <sup>2</sup>USDA, ARS, Grazinglands Research Laboratory, El Reno, OK, <sup>3</sup>Texas Tech University, Lubbock.

Typically the adaptation of beef cows that is required in the subtropics has been accomplished by using percentage Brahman breeding. They are well adapted for the stresses of the subtropical environment, but carcass merit of market animals has been questioned. A herd of Romosinuano (R), a *Bos taurus*, Criollo breed native to Colombia has been developed at STARS, and were evaluated in a 3-breed diallel crossbreeding study with Angus (A; temperate *B. taurus*) and Brahman (B; tropical *B. indicus*). Calves (n = 135) born in 2002 were straightbred AA, BB and RR, or crossbreds (RB, BR, RA, AR, BA, AB; letters indicate breed of sire and dam, respectively). Steer calves were weaned in late September and shipped 2025 km to El Reno, OK for growing and finishing. After grazing wheat pasture until May, 2003, they were finished on a conventional feedlot diet. Steers were serially slaughtered at 97, 125 and 153 days on feed. Carcass information was collected after a 48-hr chill at 4°C. Calf age at weaning and days on feed were included as continuous variables. Sire within breed was a random term. Backfat (BF) and yield grade (YG) increased (P < 0.10) over days on feed at an increasing rate for BA and at a decreasing (P < 0.10) rate in AA, BB, and RB. Marbling score increased (P < 0.10) linearly with days on feed more rapidly

with AA and BB than with RR, while crossbreds were not different from RR. Direct effects for A, B, and R for carcass weight, BF, YG and marbling were 30.6\*\*, 37.2\*\*, and -67.8\*\* kg, 3.75\*, 2.12, and -5.67\*\* mm, 0.39\*, 0.27, and -0.66\*\*, and 193\*\*, -99\*\*, and -94\*\*, respectively (\* = P < 0.05; \*\* = P < 0.01). Heterosis (P < 0.05) was observed among all combinations for carcass weight, and for A with B and B with R for BF and YG. Angus influence increased the percentage grading choice. Tropically adapted (R or B) were similar in number choice (70%) when crossed with A.

**Key Words:** Romosinuano, Carcass Traits, Crossbreeding

**20 Relationship of sire estimated progeny differences to milk yield in Brangus cows.** M. A. Brown<sup>1</sup>, S. W. Coleman<sup>2</sup>, and D. L. Lalman<sup>3</sup>, <sup>1</sup>USDA-ARS, Grazinglands Research Laboratory, El Reno, OK 73036, <sup>2</sup>USDA-ARS, Subtropical Agricultural Research Station, Brooksville, FL 34601, <sup>3</sup>Oklahoma State University, Stillwater, 74074.

Milk yield from 160 Brangus cows was measured over a period of three years using a single-cow milking machine to estimate the relationship of sire estimated progeny differences for milk with actual milk yield of their daughters and calf weights during the preweaning period. Milk yield was estimated six times per year at an average 49, 78, 109, 138, 168, and 198 d postpartum. The relationship of sire milk EPD to milk yield of their daughters was quadratic (P < 0.01) and the linear portion of the curve differed among months (P < 0.05). Similarly, the regression of average daily milk yield and total 205-d milk yield were curvilinear (P < 0.10). The relationship of grandsire milk EPD to calf weight was quadratic (P < 0.01) with a trend for the quadratic portion of the curve to differ with month of lactation (P = 0.15) and evidence for monthly differences in the linear component of the equation (P < 0.01). A trend existed for the relationship of grandsire milk EPD with calf 205-d weight to be curvilinear (P < 0.19). However, the relationship of calf 205-d weight to milk yield of their dam was linear (P < 0.01). Results from these data suggest that genetic potential for milk yield and associated effects on calf weight transmitted through the sire has a practical maximum due to nutritional limitations that prevent expression of genetic potential beyond that level. This suggests the need to match sire milk EPD with production environment.

**Key Words:** Milk Yield, Brangus, Milk EPD

**21 Differences in calf performance and milk production for daughters of high and low Milk EPD Angus and Hereford bulls.** D. G. Bounds\*, R. J. Hammack, S. Erat, and D. S. Buchanan, Oklahoma State University.

Milk production of beef cows is a major factor affecting calf performance and profitability of cow-calf operations. The objective of this study was to evaluate the productivity of cows and determine how accurately milk EPD of Angus and Hereford sires predicted differences in milk production of their daughters and weaning weights of the daughters calves. An existing herd of cows with varying proportions of Angus, Hereford, and Brahman were bred to bulls chosen to represent high or low Milk EPD levels (twelve high Milk EPD Angus, eleven low Milk EPD Angus, nine high Milk EPD Hereford, and nine low Milk EPD Hereford). High and low Milk EPD bulls differed by 13.6 kg in Milk EPD. Heifers from these matings were born from 1989 to 1993 and were managed to begin calving at two years of age. Heifers and cows were mated to bulls from several breeds. Total milk production from 37 to 205 d, 205-d weight, non-adjusted weaning weight and pre-weaning ADG were evaluated for cow-calf pairs (n = 1843) calving in either the spring or fall from 1991 to 2000. High Milk EPD sired cows produced 107.47 kg more total milk than low Milk EPD sired cows (P < 0.05). Angus-sired cows produced 41.89 kg more total milk than Hereford-sired cows (P < 0.05). Spring calving cows produced 51.31 kg more total milk than fall calving cows (P < 0.05). High Milk EPD sired cows had 13.83 kg heavier calves at day 205 than calves from low Milk EPD sired cows (P < 0.0001). Milk EPD are accurate predictors of progeny performance in the Angus and Hereford breeds and can be utilized by producers as a tool in selection and culling programs in purebred and commercial beef herds to increase calf weaning weight and daily gain.

**Key Words:** Beef Cattle, Expected Progeny Difference, Milk Production

**22 Heterosis retention in Brahman-Angus and Brahman-Hereford F<sub>2</sub> cows for reproductive traits and maternal effects on survival and weight traits of their calves.** K. L. Key\*, J. O. Sanders, and D. K. Lunt, *Texas A&M University*.

Reproductive and maternal performance was evaluated from 1996 to 2003 in 365 females of 7 breed groups (BG): Angus (A), Brahman (B), Hereford (H), F<sub>1</sub> BA, F<sub>1</sub> BH, F<sub>2</sub> BA, and F<sub>2</sub> BH. Calf crop born (CB), calf crop weaned (CW), and calf survival (CS) were analyzed using the fixed effects of dam BG, sire breed of dam within dam BG, and age of dam and the random effect of dam within dam BG. Adjusted means for CB for A, B, and H were 92.2±3.5, 67.5±3.0, and 79.5±3.3%. F<sub>1</sub> BA, F<sub>2</sub> BA, F<sub>1</sub> BH, and F<sub>2</sub> BH groups had adjusted means for CB of 89.6±3.2, 73.5±3.5, 89.3±2.3, and 85.1±3.4%. A, B, and H had adjusted means for CW of 78.3±4.4, 54.0±3.7, and 68.6±4.0%. Adjusted means for CS for F<sub>1</sub> BA, F<sub>2</sub> BA, F<sub>1</sub> BH, and F<sub>2</sub> BH were 79.4±3.9, 56.3±4.2, 82.5±2.6, and 75.8±4.2%. The F<sub>1</sub> BA, F<sub>1</sub> BH, and F<sub>2</sub> BH groups all exceeded their respective midparents (MP) for CB and CW, but the F<sub>2</sub> BA group means were below the MP. Adjusted means for CS were 87.0±3.3, 84.3±3.2, and 90.4±3.1% for A, B, and H. F<sub>1</sub> BA, F<sub>2</sub> BA, F<sub>1</sub> BH, and F<sub>2</sub> BH adjusted means for CS were 92.9±3.0, 85.6±3.5, 93.6±2.4, and 95.3±3.3%. All groups except F<sub>2</sub> BA exceeded the MP values for CS. Birth weight (BW) was analyzed using the fixed effects of dam BG, sire breed of dam within dam BG, calfs birth year/age of dam, sex of calf, and dam BG by sex of calf as well as the random effect of dam within dam BG. Adjusted means for BW for A, B, and H were 35.2±0.7, 32.8±0.5, and 34.3±0.6 kg. Adjusted means for F<sub>1</sub> BA, F<sub>2</sub> BA, F<sub>1</sub> BH, and F<sub>2</sub> BH for BW were 35.8±0.6, 36.1±0.7, 35.1±0.7, and 34.5±0.6 kg. Weaning weight (WW) was analyzed using the fixed effects of dam BG, calfs birth year/age of dam, sex of calf, and age of calf and the random effect of dam within dam BG. A, B, and H had adjusted means for WW of 180.1±4.1, 204.5±3.4, and 153.2±3.6 kg. Adjusted means for WW for F<sub>1</sub> BA, F<sub>2</sub> BA, F<sub>1</sub> BH, and F<sub>2</sub> BH were 209.7±4.0, 196.9±4.3, 220.9±3.7, and 196.5±3.7 kg. All F<sub>1</sub> and F<sub>2</sub> groups exceeded the MP values for both BW and WW.

**Key Words:** Heterosis, Reproductive Traits, Maternal Effects

**23 Evaluation of ultrasound body composition traits among long yearling Brahman bulls.** D. T. Dean\* and A. D. Herring, *Texas A&M University, College Station*.

The purpose of this study was to evaluate ultrasound body composition and size traits of long yearling Grey Brahman bulls and to estimate additive genetic values of their sires at a single operation. Purebred bulls (n = 284), ranging in age of 498 to 647 days, were evaluated in October of 2003 for longissimus muscle area (ULTREA), back fat (ULTBFAT), and intramuscular fat percentage (ULTIMF). Weight (WT), hip height (HHT), and scrotal circumference (SC) were also taken on the same date. There were 52 sires represented. During development, bulls were fed a 50% concentrate-50% roughage diet twice daily, comprised primarily of corn, cottonseed hulls, and warm season grass hay. Mixed model analyses were used to study ultrasound traits with sire as a random effect and ranch division (as contemporary group) and the regression on age at scanning as fixed effects. Heritability estimates were calculated with 4 times the sire variance as the estimate of additive genetic variance, and sire variance plus the residual variance as the estimate of phenotypic variance. Simple linear correlations between these measurements were also calculated. Averages for the group for ULTREA, ULTBFAF, ULTIMF, WT, HHT, SC, and age were 78.2 cm<sup>2</sup>, .48 cm, 2.49%, 554.9 kg, 143.0 cm, 32.4 cm, and 557 days, respectively. Ranges in estimates of sire additive genetic values for ULTREA, ULTBFAF, and ULTIMF were -2.72 to 4.94 cm<sup>2</sup>, -.065 to .094 cm, and -.110 to .190%, respectively. Heritability estimates for ULTREA, ULTBFAF, and ULTIMF were 0.397 ± .207, 0.418 ± .209, and 0.179 ± .182, respectively. Correlations involving ULTREA and ULTBFAF (.12), and ULTREA and ULTIMF (.16) were small (P < .05). The correlation between ULTBFAF and ULTIMF was .41 (P < .001). The correlation between SAGE and ULTREA was not significant; correlations of SAGE with ULTBFAF (.21) and SAGE with ULTIMF (.20) were small (P < .05). Based on these data, there appears to be sufficient genetic variation in ULTREA, ULTBFAF and ULTIMF in young Brahman bulls, but how useful this

information is in regard to carcass composition of progeny, and determination of optimum age for ultrasound evaluation in Brahman breeding cattle need to be investigated.

**Key Words:** Ultrasound Body Composition, Brahman Bulls, Additive Genetic Values

**24 Residual feed intake of growing bulls and relationships with temperament, fertility and performance traits.** J. T. Fox\*<sup>1</sup>, G. E. Carstens<sup>1</sup>, E. G. Brown<sup>1</sup>, M. B. White, III<sup>1</sup>, S. A. Woods<sup>1</sup>, T. H. Welsh, Jr.<sup>1</sup>, J. W. Holloway<sup>2</sup>, B. G. Warrington<sup>2</sup>, R. D. Randel<sup>3</sup>, D. W. Forrest<sup>1</sup>, and D. K. Lunt<sup>4</sup>, <sup>1</sup>*Texas Agriculture Experiment Station, College Station*, <sup>2</sup>*Texas Agriculture Experiment Station, Uvalde*, <sup>3</sup>*Texas Agriculture Experiment Station, Overton*, <sup>4</sup>*Texas Agriculture Experiment Station, McGregor*.

Residual feed intake (RFI) is a moderately heritable feed efficiency trait that is independent of changes in ADG and BW. Objectives of this study were to measure RFI in growing bulls and examine phenotypic correlations between RFI and performance, body composition, escape velocity (indicator of temperament) and fertility traits. Bonsmara bulls (n = 62) were individually fed a roughage-based diet (ME = 1.7 Mcal/kg) using Calan-gate feeders. After 30 d of adaptation, weekly BW and DMI were measured for 70 d, and RFI calculated as the residual value from linear regression of DMI on mid-test BW<sup>0.75</sup> and ADG. Ultrasound measures of 12<sup>th</sup> rib fat thickness (BF), longissimus muscle area (REA), percent intramuscular fat (IM), escape velocity, and scrotal circumference were measured on d 0 and 70. Breeding soundness exams were performed at 5 d post-trial. As expected, RFI was not correlated with final BW or ADG, but was correlated (P < .001) with DMI (r = 0.65), and feed conversion ratio (FCR; r = 0.85). FCR was correlated with final BW (r = 0.26; P < .05), ADG (r = -0.18; P = .15), and DMI (r = 0.62; P < .001). RFI of low (< 0.5 SD below the mean; n = 17) and high (> 0.5 SD above the mean; n = 21) bulls were -1.32 and 1.11 ± .13 kg/d, respectively. Low RFI bulls had 21% lower (P < .001) FCR than high RFI bulls even though overall ADG (1.77 ± .05 kg/d) and final BW (382 ± 9.0 kg) were not different. RFI was not correlated with REA, but there was a tendency (P < .10) for RFI to be correlated with final BF (r = 0.20), and final IM (r = 0.23). FCR was correlated with IM (r = 0.25; P < .05), but not with BF or REA. Escape velocity on d 0 was correlated (P < .05) with DMI (r = -0.34) and ADG (r = -0.25), but not with RFI or FCR. Scrotal circumference was not correlated with RFI on d 0 or 70, but was correlated (P < .05) with FCR on d 0 (r = 0.39) and d 70 (r = 0.25). Sperm motility was not correlated with RFI or FCR. These results suggest that selection for RFI to improve feed efficiency independent of growth traits will not alter bull fertility.

**Key Words:** Residual Feed Intake, Beef Cattle, Bull Fertility

**25 Postpartum maternal behavior score and preweaning calf performance in six breed groups of beef cattle.** A. H. Brown, Jr.\*<sup>1</sup>, Z. B. Johnson, J. A. Hornsby, B. A. Sandelin, and R. T. Baublits, *University of Arkansas*.

The objectives of this study were: 1) determine the effects of fixed sources of variation on postpartum maternal behavior score (MBS); and 2) determine effects of MBS for preweaning calf traits. Postpartum MBS were determined on 5447 births involving the progeny of 142 sires and 145 maternal grandsires used in the purebred herds of the University of Arkansas Agricultural Experiment Station over a 25 yr period. Breed groups included Angus (n = 2250), Charolais (n = 585), Hereford (n = 738), Heritage Angus (n = 497), Polled Hereford (n = 1013), and Red Poll (n = 364). Within 24 h of birth, MBS were assigned as the handler obtained calf birth weight and body condition of each calf. Postpartum MBS were: 1) very aggressive, 2) very attentive, 3) indifferent, 4) apathetic. Variation in MBS across breed was partitioned using a model that included terms for an overall mean, year, breed, age of dam, sex of calf, body condition of calf, sire of calf, and maternal grandsire of calf. Variation in preweaning traits (birth weight, 120-d weight and 205-d weight) for MBS was separated with a model that included the fixed effects shown in the previous model, and MBS. Across breed, important sources of variation (P < 0.01) in MBS were year, age of dam, body condition of calf at birth, breed, sire within breed and sire of dam within breed. Dams giving birth to calves in thin body condition had greater (P < 0.01) mean MBS than dams giving birth to calves in average or fat body condition (2.34 vs 2.24 vs 2.19), respectively. Across breed, important sources of variation (P < 0.01) in preweaning traits, and calf condition were: sex of calf, age of dam, breed, sire within breed, and sire

of dam of calf within breed. Maternal behavior score was an important source of variation in 120-d weight ( $P < 0.05$ ) but tended to influence birth weight ( $P < 0.09$ ), and 205-d weight ( $P < 0.06$ ). These results suggest MBS is influenced by several sources of variation and that MBS may impact preweaning growth traits.

**Key Words:** Maternal Behavior, Calf Performance

## 26 Effects of climatic and phototropic conditions prior to feeding on feed intake of beef bulls during feedlot performance tests. G. T. Tabler\*, A. H. Brown, Jr., Z. B. Johnson, E. E. Gbur, Jr., I. L. Berry, K. C. Thompson, and D. W. Kellogg, *University of Arkansas*.

Climatic and phototropic conditions prior to feeding were analyzed to identify and quantify effects on feed intake of performance-tested beef bulls. Feed intake data originated from bulls ( $n = 1,874$ ) in University of Arkansas Cooperative Bull Tests at Fayetteville, Hope and Monticello during 52 trials from 1978 to 1990. Bulls were given a 21-d adjustment period then individually full-fed a total mixed ration twice daily (0800 to 1000 and 1500 to 1700) from the same stall for 140 d. Diet contained 1.6 Mcal NEm, 0.9 Mcal NEg and 12% CP per kg DM. Initial weight and age were recorded at start of each test with weights taken at 28-d intervals thereafter. Photoperiod and climate data were obtained from U.S. Naval Observatory (Washington, DC) and National Climatic Data Center (Asheville, NC), respectively. Variables included maximum temperature; minimum temperature; rainfall; daylength; and from 0400 to 0800 and 1100 to 1500, temperature; dew point temperature; barometric pressure; relative humidity; and wind speed. Data were pooled, divided into five 28-d periods, with each period analyzed separately using all animals over all tests. Initial weight and age were included in principal components regression as independent variables to adjust for initial animal differences. Principal component analysis was used to reduce number of independent variables in the regression and overcome collinearity associated with numerous climatic variables. Three principal components within each period accounted for 58% to 66% of variability in explanatory variables. Ten to 15 components accounted for 96% to

99% of variability. Results provide increasing evidence of the role climate conditions play on cattle feeding and indicate individual climatic and phototropic components have differing effects on intake.

**Key Words:** Beef Cattle, Feed Intake, Climate

## 27 Sire breed and dam breed effects on preweaning traits of crossbred and purebred calves from Angus or Hereford dams. E. L. Oxford\*, A. H. Brown, Jr., and Z. B. Johnson, *University of Arkansas*.

The objective of this study was to evaluate variation in calf performance from birth to weaning due to breed of sire (BRS), breed of dam (BRD), sex of calf and all interactions. Records from 2352 calves born at the Pinetree Research unit of the Arkansas Experiment Station were utilized in the study. Calves resulted from mating Angus (A) and Hereford (H) dams to Angus, Hereford, Charolais (CH), Santa Gertrudis (S), Red Poll (R), Brown Swiss (B), or Holstein (HO) sires. Data collected were birth weight (BWT), preweaning average daily gain (ADG), weaning weight (WWT), weaning grade (WGR) and weaning body condition (WBC). Birth weight and WWT were adjusted according to BIF standards prior to analysis. Data were analyzed by ANOVA with unequal subclass numbers. Weaning grade and WBC were visual appraisals placed on the individual animals at weaning by trained personnel. Year, BRS and BRD were significant ( $P < 0.01$ ) for all traits studied. The interaction of BRS  $\times$  BRD was significant ( $P < 0.05$ ) for BWT, WWT and WGR. Sex of calf was significant ( $P < 0.01$ ) for all traits except WBC. Male calves were heavier ( $P < 0.01$ ) at birth ( $30.6 \pm 0.2$  kg vs.  $28.5 \pm 0.2$  kg) and weaning ( $204.0 \pm 1.0$  kg vs.  $185.1 \pm 1.6$  kg) and had a greater ( $P < 0.01$ ) WGR ( $11.90 \pm .06$  vs.  $11.55 \pm 0.06$ ) than female calves. The interaction of BRS  $\times$  BRD illustrated birth weight was greater ( $P < 0.05$ ) for CH  $\times$  H and S  $\times$  H when compared to CH  $\times$  A and S  $\times$  A. Within all sire breeds except A, calves from A dams had a greater ( $P < 0.05$ ) WWT than calves from the H dams. Within all sire breeds except HO, weaning grade was greater ( $P < 0.05$ ) for calves from A dams versus H dams. These data indicate that calves from S, CH, R, H and B bulls crossed with A dams, have more growth potential from birth to weaning than calves from S, CH, R, H and B bulls crossed with H dams.

**Key Words:** Beef Cattle, Crossbreeding, Calf Performance

## Extension

### 28 Assessment of awareness and constraints in production of Guinea Fowl in Tennessee and other parts of the United States. S. N. Nahashon, A. Amenyenu\*, S. Muhammad, N. Adefope, and D. Wright, *Institute of Agricultural and Environmental Research, Tennessee State University*.

Interest in guinea fowl (GF) as a specialty meat bird appears to be increasing in the United States (US). This provides an opportunity for small scale farmers to benefit in this promising industry. Although there is limited knowledge of optimum management practices for GF, interest in GF production has increased gradually. With the aim of devising some mechanism of improving GF production, this study was designed to assess the awareness and constraints facing the GF industry. Surveys were designed by Tennessee State University's Poultry Research Team in collaboration with the Guinea Fowl Breeders Association (GFBA). The GFBA and extension agents provided mailing lists of members of the GFBA throughout the US and small scale farmers from the state of TN, respectively. All individuals ( $n = 220$ ) on the mailing lists were surveyed. Results indicated that there are GF farmers in 28 states and the majority are small scale farmers. Most of the respondents (94.3%) were only familiar with GF while 71.4% of those who were not familiar with GF expressed interest in raising GF. About 85% of the respondents raised guinea fowl while 33 and 21% of the respondents also raised chickens and livestock, respectively. Of the total respondents, Texas had a higher percentage of GF producers (10.1%) compared to TN which had 6.7%. About 24% of the respondents raised GF for eggs and meat and 29.1% raised 50 to 2,000 guineas. These GF producers (61.7%) also expressed the need for production and management training. Pooled standard error of mean estimates was 0.22%. This study revealed the need for University Institutions involvement in promoting the GF industry and in assisting farmers to improve GF production efficiency through research and marketing. The study also demonstrates the desire for GF

production by small scale farmers and the need for assistance through research to make GF production a profitable and lucrative business for small scale farmers in the state of TN and other parts of the US.

**Key Words:** Guinea Fowl, Meat and Egg Production, Marketing

### 29 Spray dried plasma in the initial post-weaning diet improves pig performance during phase I with no effects in subsequent diet phases. J. Zhao, A. F. Harper\*, K. E. Webb, Jr., and M. J. Estienne, *Virginia Polytechnic Institute and State University, Blacksburg*.

Inclusion of spray dried plasma protein (SDPP) in diets for early-weaned pigs improves post-weaning growth but increases diet cost. The objective of this experiment was to determine the effect of replacement of SDPP with a marine-based hydrolyzed protein (Peptiva, VITECH BIOCHEM, San Fernando, CA) in the phase I diet on performance of weaning pigs ( $n = 140$ , 6.35 kg BW, 17 d of age). The five diet treatments were: 1) a corn-soy-whey control diet, 2) a diet similar to diet 1 but containing 6 % SDPP, 3) a diet identical to diet 2 except half of SDPP was replaced with Peptiva, 4) a diet identical to diet 2 except all SDPP was replaced with Peptiva, and 5) a diet containing 6 % Peptiva with adjustments to have nutrient and energy levels similar to diets 1 and 2. Experimental diets were fed for the initial 10 d after weaning. All pigs were then fed a common phase II diet for the next 10 d and a common phase III diet for the final 15 d. During phase I, ADG was 116, 163, 111, 109 and 107 g (SEM 11 g) and ADFI was 221, 295, 228, 231 and 205 g (SEM 13 g) for diets 1 through 5, respectively. Pigs fed diets with 6% SDPP had greater ( $P < 0.05$ ) ADG and ADFI compared to pigs fed all other diets. Pigs fed the diet with 6% Peptiva adjusted for energy and amino acid content during phase I had improved ( $P < 0.05$ ) feed-to-gain ratio relative to the control pigs during phase II. No

other treatment effects were observed during phase II or phase III. For the overall 35-d trial, ADG was 396, 418, 392, 398 and 405 g (SEM 14 g), ADFI was 684, 723, 668, 689 and 682 g (SEM 48 g) and feed-to-gain ratio was 1.73, 1.73, 1.71, 1.74 and 1.69 (SEM 0.03) for diets 1 through 5, respectively, with no treatment effects. Calculated feed cost per kg of pig gain over the 35-d trial was 0.388, 0.432, 0.395, 0.388 and 0.379 dollars for diet treatments 1 through 5, respectively. In summary, inclusion of SDPP in the phase I diet improved growth performance during phase I, but the improvement was not maintained in subsequent phases.

**Key Words:** Performance, Pigs, Spray Dried Plasma

### **30 Arkansas EIA verification program: A partnership of extension, industry and regulatory.** S. M. Jones\*, *University of Arkansas Cooperative Extension Service.*

Equine Infectious Anemia (EIA) is an infectious viral disease that affects all members of the family equidae. The disease can cause acute deaths during outbreaks, but is most often found in the chronic form. There is no treatment or cure. Once an animal becomes infected, it remains infected for the rest of its life and is capable of transmitting the disease to other susceptible horses. The primary vector for transmission is the horse fly. Arkansas has historically had one of the highest infection rates in the United States. In 1991, EIA infection rate for test submissions was 1.5%. In 1997, the Arkansas General Assembly required that all horses have a yearly negative EIA test. The Arkansas General Assembly established the EIA Verification Program. This program authorized the recruitment and training of volunteers to verify all equidae participating in events have a negative EIA test. A certified EIA verifier must complete a verification course co-sponsored by the Arkansas Livestock and Poultry Commission, Cooperative Extension Service-University of Arkansas, and the Arkansas Horse Council. These organizations planned the curriculum. Initially classes were taught by Livestock and Poultry Commission personnel. The curriculum included information about EIA, understanding current laws, how to identify individual horses, how to read an EIA test chart, and how to determine the validity of a test chart. A written test was required for certification, with a correct answer rate of 80%. Ninety-nine percent of the applicants passed the written test. After the programs first year, a program evaluation was conducted. It was determined that the Extension Service would plan and conduct the EIA Verification classes starting in 2002. Fifty-four county agents were trained as EIA Verification Program Instructors. Classes were conducted in 67 of the 75 Arkansas counties and there were 1,687 Certified EIA Verifiers in Arkansas. The number of horses tested and the number of horses testing positive for EIA increased 45% and decreased 48%, respectively, in 2001 as compared to 1997.

**Key Words:** Equine Infectious Anemia, Extension, Horses

### **31 An inventive approach: Horse ownership courses.** O. F. Harper, J. Hall, J. Goddard, J. Rhea, and M. Bedwell, *University of Tennessee.*

Increasing horse numbers and activities, along with a vastly changing agriculture landscape, has East Tennessee Extension agents seeking new educational programs to serve a new and diverse horse audience. A Horse Ownership Course was instituted in the spring of 2002 as a program format to meet this need. The Horse Ownership Course is a multi-series basic program focusing on five key areas of horse ownership: facilities, feeding, management, health care and selection. While open to all individuals, the targeted audience is new or prospective horse owners, owners seeking up to date information and individuals that have not previously attended an Extension horse program. Marketing is broader based than traditional horse management courses. Tack shops and small animal veterinarians have been targeted as contact points for participants. Alumni have also been asked to distribute course brochures. All courses are managed by a leadership team of at least two Extension agents and a horse specialist. The success of the initial endeavor and support from Extension agents and the Extension District program leader resulted in two Horse Ownership Courses in the fall of 2002 and three in the fall of 2003. Individuals attending these courses range from owning none to 20 horses each, from zero to 52 years of horse experience and from none to 100 acres of pasture. While other horse programs are designed for repeat participation year-after-year, the Horse Ownership Course is as a one-time program. Participants are given a certificate at the completion of the course. Size of courses is limited to 35 individuals and all material is presented by extension personnel. At the completion of this program, individuals are encouraged to attend other

upcoming Extension horse programs. Horse Ownership Courses have been attended by 133 individuals who evaluated the courses at a score of 4.6 on a 5 point scale.

**Key Words:** Horse, Extension, Ownership Course

### **32 4-H High Adventure Horse Packing Program.** S. M. Jones\*, *University Of Arkansas Cooperative Extension Service.*

Trail riding is the most common form of horse recreation in Arkansas. As recreational riders seek out remote locations, horse packing has become popular. Therefore, the Arkansas 4-H Horse Packing High Adventure Program, which includes a 5-day wilderness pack trip to New Mexico, was established. In August 2003, Arkansas conducted the third 4-H High Adventure Horse Packing Program. Participants completed an application form and sent a deposit for the cost of the trip. Participants included 4-H members, adult volunteers, and Extension faculty. Participants attended three required training sessions. Session I was an introduction, overview of the program and stressed team building skills. Session II emphasized low impact camping techniques, wilderness survival, outdoor cookery, trail etiquette, horse care and nutrition, horse and human first aid, and packing techniques. Participants were given a list of required horse equipment and instructed how to use them. Training Session III consisted of a weekend trail ride in which participants applied their skills. Horse equipment preparation and proper adjustment was emphasized. Horses were also evaluated for physical fitness and disposition. Evaluations reflected that participants learned new or improved skills in wilderness survival, horsemanship, and low impact camping. There was an observed improvement in self-esteem by the youth participants. Over 40% of participants were parent-child teams. These teams indicated that the program strengthened family relationships. There have been three horse packing crews (1999, 2001, 2003) in the Arkansas 4-H High adventure Program. These included 21 youth, 16 parents, and 3 adult horse project leaders. The success of the program has resulted in positive impact on local Extension programs. Five counties in Arkansas are now conducting county programs using the same curriculum.

**Key Words:** Horse Packing, Camping, Wilderness Survival

### **33 Telephone survey of small ruminant parasite control and management in the mid Atlantic region.** J. P. Tritschler\*, M. P. L. Dismann, and B. L. Sayre, *Virginia State University.*

A detailed phone survey was conducted with small ruminant producers (n=77) in the Mid-Atlantic region, to investigate parasite control practices related to management. Questions covered farm demographics, farm management, anthelmintic usage and perceived anthelmintic problems. Small ruminant producers who also had beef cattle had significantly more acreage (105 vs 68 ac;  $p < 0.01$ ), more pasture land (54 vs 24 ac;  $p < 0.01$ ) and more grazed woodlands (12 vs 5 ac;  $p < 0.05$ ). Not surprisingly, these producers used less anthelmintics for their sheep and (or) goats ( $p < 0.09$ ). In terms of stocking density (measured in animal units per acre of grazing land), smaller farms were more heavily stocked ( $p < 0.0001$ ). Whereas the number of sheep (or cattle;  $p < 0.02$ ) decreased with decreasing acreage, the quantity of goats actually increased. This suggests that goat producers are more likely to overstock pastures. This creates some confounding of stocking density and goat production, as producers with the highest stocking density used more anthelmintics ( $p < 0.02$ ), and goat producers had more problems with anthelmintics both in terms of dosage used ( $p < 0.01$ ) and discarding specific anthelmintics for a variety of reasons ( $p < 0.05$ ). Although an objective of the survey was to investigate differences in demographics or management practices that might be associated with perceived anthelmintic failure, analysis did not reveal any significant or suggestive differences. This may be attributed to different response patterns between goat and sheep producers (particularly those who also had beef cattle), misunderstanding about proper anthelmintic usage by small ruminant producers, and (or) inconsistent patterns of anthelmintic usage and failure across the survey sample. In spite of this lack of association, on-farm anthelmintic testing on a sub-set (n=20) of these farms indicated widespread anthelmintic failure.

**Key Words:** Parasite Control, Small Ruminant

**34 Seasonal mineral imbalances in Tennessee forage systems.** A. E. Fisher, W. W. Gill\*, C. D. Lane, Jr., D. K. Joines, and J. B. Neel, *University of Tennessee*.

Surveys indicate that cattle originating in the Southeast have high incidences of feedlot morbidity and mortality and have reported a relationship to mineral deficiencies and imbalances. This led to concerns about the mineral content of Tennessee tall fescue forage systems. The objective of this 3-year forage survey was to determine the mineral levels of tall fescue based forage systems and if seasonal differences exist. Extension agents collected 834 forage samples from across the state during the spring (May) and fall (August/September) of 2001, 2002 and 2003. The samples were sent to a commercial laboratory for analysis. All data were analyzed using the MIXED and FREQ procedures of SAS and differences were determined at  $P < 0.05$ . The means of mineral levels for year and season are listed in Table 1. Copper (Cu) was at least marginally deficient in 92.4% of the samples and sulfur (S) was considered at least marginally antagonistic to copper in 89.3% of the samples. Zinc was classified at least marginally deficient in 83.1% of the forage samples. In 23.0% of the samples, potassium was above the maximum tolerable concentration. Forage Cu levels are low and are lower in the fall than in the spring. Forage S levels are often high enough to be antagonistic to copper utilization, and are higher in the fall than in the spring. Magnesium levels are lower and potassium levels are higher in the spring than the fall. Results indicating year and season variation in forage minerals could provide basis for improving mineral nutrition of beef herds.

Table 1. Means of mineral levels by year and season.

	Year			Season	
	2001	2002	2003	Spring	Fall
Calcium, %	0.53 <sup>A</sup>	0.53 <sup>A</sup>	0.51 <sup>A</sup>	0.49 <sup>B</sup>	0.56 <sup>A</sup>
Phosphorus, %	0.36 <sup>A</sup>	0.42 <sup>A</sup>	0.35 <sup>A</sup>	0.35 <sup>A</sup>	0.41 <sup>A</sup>
Sodium, %	0.01 <sup>B</sup>	0.01 <sup>A</sup>	0.01 <sup>AB</sup>	0.01 <sup>A</sup>	0.01 <sup>B</sup>
Magnesium, %	0.26 <sup>A</sup>	0.27 <sup>A</sup>	0.26 <sup>A</sup>	0.23 <sup>B</sup>	0.30 <sup>A</sup>
Potassium, %	2.63 <sup>A</sup>	2.52 <sup>B</sup>	2.56 <sup>AB</sup>	2.67 <sup>A</sup>	2.46 <sup>B</sup>
Sulfur, %	0.28 <sup>AB</sup>	0.27 <sup>B</sup>	0.28 <sup>A</sup>	0.26 <sup>B</sup>	0.30 <sup>A</sup>
Manganese, ppm	106.24 <sup>B</sup>	110.41 <sup>B</sup>	131.32 <sup>A</sup>	108.52 <sup>B</sup>	123.46 <sup>A</sup>
Copper, ppm	7.56 <sup>A</sup>	5.06 <sup>C</sup>	6.90 <sup>B</sup>	6.85 <sup>A</sup>	6.17 <sup>B</sup>
Zinc, ppm	24.92 <sup>B</sup>	21.47 <sup>C</sup>	28.05 <sup>A</sup>	22.43 <sup>B</sup>	27.20 <sup>A</sup>

<sup>A,B,C</sup>Row means within year and season not sharing superscripts are significantly different at  $P < 0.05$ .

**Key Words:** Mineral imbalances, seasons, copper, sulfur

**35 Soil forage mineral interrelationships.** A. E. Fisher, C. D. Lane, Jr.\*, W. W. Gill, D. K. Joines, and J. B. Neel, *University of Tennessee*.

Symptoms of mineral deficiencies and imbalances have been observed in Tennessee (TN) cattle. Recent work has shown mineral deficiencies and imbalances in TN forage systems. These deficiencies and imbalances have involved copper (Cu), sulfur, zinc (Zn), selenium, magnesium and potassium (K). Information is limited about the extent to which a link exists between soil, forage and animal mineral levels. As a part of a larger forage mineral survey, Extension Agents across the state were asked to collect 1-2 forage and soil samples from their county. Of the forage samples collected, 222 had corresponding soil samples. The forage samples were shipped to a commercial laboratory for analysis and the soil samples were analyzed for soil pH, soil phosphorus (P) and soil K by the University of Tennessee Soil Testing Laboratory. The data were analyzed using the CORR procedure of SAS and correlations were determined significant from zero at  $P < 0.05$ . The means and ranges for selected soil and forage parameters are listed in Table 1. A significant negative correlation was found between soil pH and forage manganese, forage Cu and forage Zn. Most minerals had a positive correlation with each other, suggesting that a high level of one mineral relates to high levels for most minerals. A significant positive correlation was found between soil pH and soil P, soil P and forage P, soil K and forage K and soil K and forage sodium. It is possible that minor minerals that perform similar functions within the animal are more related to each other in the forage and that soil pH will have common effects on the levels of these forage minerals.

Table 1. Means and ranges for selected soil and forage parameters.

	Mean	Minimum	Maximum
Soil pH	6.4	4.8	7.5
Soil Phosphorus, kg/hectare	58.8	4.4	134.4
Soil Potassium, kg/hectare	189.5	30.1	359.5
Forage Manganese, ppm	129.6	23.0	1173.0
Forage Copper, ppm	6.8	3.0	15.0
Forage Zinc, ppm	26.8	12.0	168.0
Forage Phosphorus, %	0.4	0.2	0.7
Forage Potassium, %	2.5	1.1	4.3

**Key Words:** Soil pH, Forage Minerals, Relationships

**36 Assessing impact of Extension programming for correcting mineral imbalances and deficiencies in Tennessee beef cattle.** J. B. Neel\*, W. W. Gill, C. D. Lane, Jr., D. K. Joines, and A. E. Fisher, *University of Tennessee*.

University of Tennessee Extension Agents and Specialists have had numerous reports of problems related to the mineral nutrition of beef cattle. These problems have sometimes been related to magnesium deficiency (and possible excess potassium), but are also related to deficiencies and imbalances of copper, sulfur, zinc and possibly selenium and other minerals. A forage mineral survey was conducted and recommendations for improving beef herd mineral nutrition were developed. County agents that participated were provided information about adjusting mineral supplementation programs based on forage mineral analysis. These data have been presented in at least 71 county meetings, field days and cattlemen's meetings (29 in 2003). A survey was conducted in 14 of the county beef meetings. An average of 19.9 herds were represented at the meetings with an average herd size of 64.7 cows. The survey indicated that 78.5% of the producers recognized symptoms in their cattle that were substantial enough that they would modify their mineral program. When asked to estimate production losses based on their herd status combined with what they had learned during the program, annual losses averaged \$910 per farm. When calculated on a per meeting basis, estimated losses due to mineral imbalances and deficiencies were \$18,211. Total losses for the 14 meetings are estimated at over \$254,954. For reporting purposes, efforts have been made to extrapolate this to estimate impact of all meetings. Beef producers were asked to rate meeting Usefulness and Quality on a five-point scale (1 = low; 5 = high). Average Usefulness was 4.60 and average meeting Quality was 4.62. They were also asked to rate their subject matter knowledge on a similar 5-point scale at the beginning and at the end of the meeting. Beginning knowledge was 1.96 and ending knowledge was 4.10, for an increase of 120%.

**Key Words:** Mineral Imbalances, Survey, Extension

**37 Arkansas beef improvement program - whole farm program.** T. R. Troxel\*, M. S. Gadberry, J. A. Jennings, and D. E. Kratz, *University of Arkansas Cooperative Extension Service*.

The goal of the Arkansas Beef Improvement Program (ABIP) was to balance ranch resources using an integrated resource management approach to enhance the efficiency and profitability of cattle producers. The objective of this study was to determine if ABIP was achieving its educational goal. Seven management practices were implemented annually to monitor changes and make management adjustments. They included cow-calf budget, forage testing, soil testing, cow herd performance, enrolling steers in the Arkansas Steer Feedout Program, pasture inventories, and completing production calendars. Benchmark data was collected during yr 1, and in yr 2, a plan of work was established to reach the cooperators' goals. Since 1992, 12 cooperators completed the ABIP whole farm program. The most common goal expressed by the cooperator was to improve beef cattle production efficiency. The mean  $\pm$  SD number of mature cows during yr 1 was  $68 \pm 46.7$  hd and increased by 34.1% ( $P = 0.06$ ) to yr 5 ( $91 \pm 81.6$  hd). Herd break-even decreased by 28.2% ( $P = 0.03$ ) from yr 1 ( $\$1.17 \pm 0.27$ /kg) to 5 ( $\$0.83 \pm 0.31$ /kg;  $P = 0.01$ ). Major factors that influenced herd break-evens were increased beef production, reduced specific production cost, or both. Beef sold per animal unit (AU; kg/AU) in yr 1 was  $197.5 \pm 72.20$  kg. Beef cattle sold included steers, heifers not kept for replacements, and cull bulls and cows. Beef sold per AU numerically improved by 23.6% to  $244.2 \pm 156.2$  kg by yr 5. Specified cost per AU tended to decrease 22.9% ( $P =$

0.19) from yr 1 (\$226.35 ± 108.05) to 5 (\$174.42 ± 79.16). The average mature cow calf crop percentage in yr 1 was 84.6% ± 11.15 and tended to increase ( $P = 0.14$ ) to 93.3% ± 5.24 by yr 5. The percentage change in calf crop was significant ( $P < 0.01$ ) when compared to 0% increase. Overall, economic return over specified cost per AU increased 121.7% ( $P = 0.05$ ). Return over specified cost per AU in yr 1 was \$98.50 ± 62.43 and increased ( $P = 0.04$ ) to \$218.35 ± 92.31 by yr 5. In conclusion, ABIP improved efficiency, return above specified cost, and achieved the cooperators' goals.

**Key Words:** Integrated Resource Management, Profitability, Efficiency

### 38 Arkansas beef improvement program — special projects. T. R. Troxel, M. S. Gadberry\*, J. A. Jennings, and D. E. Kratz, *University of Arkansas Cooperative Extension Service.*

The Arkansas Beef Improvement Program (ABIP) special projects addressed common beef cattle and forage management problem areas. This allowed for concentrated efforts on specific beef cattle and forage management areas and provided an opportunity for more counties to be involved. Two special projects were establishing breeding and calving seasons and replacement heifer development, and each required a 2 to 3 yr commitment. The objective of this study was to determine if the ABIP special projects were achieving their educational objectives. Five farms were enrolled in the breeding and calving season project. It took an average of 4.3 ± 0.58 yr (mean ± SD) to reach the cooperators' desired breeding and calving season goal. The percentage of cows calving during the desired calving season in the baseline year (yr = 0) was 36.5% ± 12.2 and improved to 100% in yr 5. The average length of the calving season decreased from 281.5 ± 57.0 (yr 1) to 96.7 ± 4.7 d (yr 5). When averaged across all farms, herd break-even decreased 38%, specified cost per animal unit dropped 32% and income over specified cost improved 75% from yr 0 to 3. Six cooperators participated in the replacement heifer project (18.0 ± 9.3 heifers). In yr 1, heifers reached 103.3% ± 11.2 of target weight, and in yr 2, heifers reached 102.5% ± 7.3 of target weight. The number of heifers exhibiting estrous cycles prior to the breeding season improved from 60.0% ± 13.9 in yr 1 to 82.2% ± 8.3 in yr 2. Pregnancy rates increased from 86.5% in yr 1 to 93.4% in yr 2 which was a significant ( $P < 0.05$ ) percentage change when compared to 0% increase. Feed cost per kg of gain for yr 1 and 2 were \$1.07 ± 0.73/kg and \$0.68 ± 0.19/kg, respectively. Total cost per kg of gain for yr 1 and 2 were \$1.51 ± 0.44/kg and \$1.12 ± 0.44/kg, respectively. The total cost of raising heifers to breeding (including the value of the heifer) ranged from \$732 to \$782 per hd. These two projects demonstrated that improvement in beef cattle management efficiency enhanced animal performance and economic returns.

**Key Words:** Breeding and Calving Season, Replacement Heifers, Efficiency

### 39 Arkansas beef improvement program survey. T. R. Troxel\*, M. S. Gadberry, J. A. Jennings, and D. E. Kratz, *University of Arkansas Cooperative Extension Service.*

The Arkansas Beef Improvement Program (ABIP) used a number of educational methods to demonstrate cost effective beef cattle and forage management practices including whole farm programs, special projects, workshops, county faculty training, field days, newsletters and popular press articles. Separate surveys were developed for cooperators and county faculty to determine if ABIP was achieving its educational objectives. Seventy-four surveys were mailed to past ABIP cooperators (43 whole farm and special project) and county faculty (31). Three wks following the first mailing, another survey was mailed to those who had not returned the first survey. The overall survey response rate was 79.7% (67.4% cooperator response rate and 96.8% county faculty response rate). No differences were noted between the responses of each group as to the type of ABIP information shared with others except that county faculty shared more information about the Arkansas Steer Feedout Program than did cooperators ( $P < 0.05$ ). Since all cooperators did not participate in the Arkansas Steer Feedout Program, it would be expected that fewer cooperators would share this information than county faculty. Overall, a majority of cooperators and county faculty thought their ABIP experience was most valuable (66% and 57%, respectively), and 100% and 97% of the cooperators' and county faculty's ABIP expectations were fulfilled. The ABIP experience helped build cooperator confidence, which should improve their chances for success.

County faculty used ABIP results in a variety of educational methods the most common being county programs (87%) and county newsletters (80%). Although a majority of county faculty used ABIP results at a field day (60%), not all county faculty had a field day associated with their ABIP activity. County faculty indicated that these types of programs should be high priority for Extension and agreed (82%) that the integrated resource management educational experience helped them to become a more effective Extension employee. In conclusion, ABIP is achieving its educational objectives.

**Key Words:** Integrated Resource Management, Survey, Extension

### 40 Comparison of estrous synchronization and conception rates for two prostaglandin based estrous synchronization protocols for beef heifers. T. W. Wilson\*<sup>1</sup>, J. F. Baker<sup>2</sup>, J. H. Pope<sup>3</sup>, M. E. Pence<sup>2</sup>, and P. Ham<sup>4</sup>, <sup>1</sup>The University of Georgia, Statesboro, <sup>2</sup>The University of Georgia, Tifton, <sup>3</sup>The University of Georgia, Cooperative Extension Service, <sup>4</sup>Sleepy Creek Farms, Monroe County, GA.

Beef heifers were randomly assigned within BW intervals to one of two treatments, two-shot prostaglandin (2P; n = 32) or controlled internal drug release (CIDR)/prostaglandin (CPGF; n = 31). Objectives were to demonstrate and compare estrous synchronization and conception rates for two commonly used estrous synchronization protocols. Prior to randomization, heifers were assigned a reproductive maturity tract score (scale 1 to 5) and any heifer that did not receive a score of 3 or higher was excluded. Heifers were grown to achieve an ADG of 0.84 kg·hd<sup>-1</sup>·d<sup>-1</sup>. The 2P heifers received an injection of PGF<sub>2α</sub> on d 0 and were evaluated for estrus and bred for 5 d. Any female from this group that did not show estrus by d 6 was given a second injection of PGF<sub>2α</sub> and observed for estrus and bred for an additional 5 d. The CPGF heifers received CIDR inserts on d 0, an injection of PGF<sub>2α</sub> on d 6 and CIDR's were removed on d 7. The CPGF heifers were observed for estrus for 5 d. Estrus was evaluated by visual observation with the assistance of heat mount detectors for 20 to 30 min, 3 to 4 times daily. Heifers were bred using the AM/PM rule. Pregnancy status was evaluated by a veterinarian 45 d after ending the AI breeding season. Body weight, body condition score (BCS, scale 1 to 9), and disposition (scale 1 to 5) were evaluated at the beginning and end of this comparison. More CPGF heifers responded to estrous synchronization (29/30;  $P < 0.01$ ) than 2P heifers (16/30). Response to estrous synchronization was affected by disposition ( $P = 0.02$ ). The 2P heifers that were calmer responded better to estrous synchronization (11/16). The CPGF heifers had increased conception rates (70%;  $P < 0.001$ ) to AI compared to 2P heifers (17%). At the beginning of this demonstration BCS had a tendency to affect ( $P < 0.08$ ) AI conception rates. This demonstration was successful in revealing reproductive management options to beef producers in Georgia.

**Key Words:** Beef Heifers, Estrous Synchronization, Conception

### 41 Development of a chuteside and electronic beef quality assurance (BQA) record systems. J. B. Hall\*, S. P. Greiner, J. F. Currin, and W. D. Whittier, *Virginia Tech.*

National and state Beef Quality Assurance (BQA) producer certifications require beef producers to maintain records on individual and group cattle treatments for a minimum of two years. Record keeping is often a challenge for beef producers. The objectives of this extension program were 1) to create a BQA record system for use at chuteside, 2) develop a personal digital assistant (PDA)-based electronic version of the chuteside record and 3) disseminate these record systems to producers. Extension specialists, extension agents and producers developed or adapted five forms that constitute the basis for the BQA chuteside record: Vet/Client, Individual Treatment, Group Processing, Cowherd Health Procedures and Health Product Inventory forms. Information on proper BQA procedures, directions on use of the record, and completed example forms were bound with multiple copies of record forms in a weather resistant cover to produce the 35 page Virginia BQA Chuteside Record. Approximately 200 of the BQA chuteside records have been distributed to beef producers. In the second stage of this project, the BQA chuteside record was converted to an electronic format (e-BQA) to be used on PDA handhelds. A commercially available program, Pendragon Forms<sup>®</sup>, was used to generate the e-BQA forms. The e-BQA forms feature user defined drop-down menus to streamline data input.

Information collected on the e-BQA forms is downloaded to desktop or laptop computers and output as a spreadsheet file. Ten PDA's were programmed with the e-BQA records and distributed to extension agents and experienced beef producers. The program is ongoing and current focus is on refining the e-BQA record system to make it more user-friendly. These systems appear to make BQA record keeping less difficult for beef producers.

**Key Words:** Beef Cattle, Quality Assurance, Records

#### **42 Teaching body condition scoring of beef cows using contests.** G. Selk\*, *Oklahoma Cooperative Extension Service.*

Body condition scores (BCS) have been used for over twenty years to describe the fatness of beef cows. Body condition is an extremely important physiological state that impacts reproductive performance of breeding cattle and value of cull cows. Many extension professionals have been involved with teaching producers how to assign body condition scores to their cows. Conducting body condition scoring contests can be an excellent method of teaching BCS to a large number of producers. The contests can be a portion of larger extension events. An experienced evaluator of body condition serves as the official for the contest. This individual discusses the scoring procedure using several practice cows before the contest. After the demonstration, cows are brought before the audience one at a time. The contestants then mark on a previously printed score card an X in the box that they find is appropriate for that cow. Pictures of example cows with various BCS and brief descriptions are printed on the back of the score card. Transparent copies of a blank score card are made and marked properly by the contest officials. These are used to grade each contestants completed card. Each cow is assigned 10 points. For each correctly scored cow the contestant receives 10 points. If the contestant is wrong by one-half score, then he or she receives part of the 10 points. Partial credit depends upon the officials determination as to whether the decision was close or an obvious mistake. While workers are grading the cards, the official discusses each cow as she is brought back before the audience. This gives an opportunity to discuss management strategies that are appropriate for cows in different states of body condition at different stages of the production year. In a recent multi-topic Extension program, producers gave the BCS demonstration the highest ranking topic score of 4.6 (1 = least valuable; 5 = most valuable). When asked which management practices they would change, 80% indicated that they would "pay more attention to body condition before and after calving." Body condition scoring contests have been an effective teaching tool for educating cow-calf producers.

**Key Words:** Cow Body Condition, Contest, Extension

#### **43 Factors influencing beef producers participation in preconditioned certified calf sales.** M. D. Corro\*<sup>1</sup>, D. Lalman<sup>2</sup>, J. D. White<sup>1</sup>, and R. P. Wettemann<sup>2</sup>, <sup>1</sup>*Department of Agricultural Education, Oklahoma State University,* <sup>2</sup>*Department of Animal Science, Oklahoma State University.*

Survey data were collected from Oklahoma Quality Beef Network (OQBN) participants during the fall of 2001 and 2002 to determine factors which influence beef industry stakeholders to participate in certified preconditioned calf sales. A total of 291 stakeholders that either bought or sold cattle through the OQBN during the fall of 2001 and 2002 were identified. One hundred eighteen stakeholders (40.5 %) responded to

the survey. The chi-square test was used to evaluate differences between groups of stakeholders and sales. A majority, 68.5 % of the beef industry stakeholders became aware of preconditioned certified sales through Extension offices, auction barn operators and Cattlemens Association meetings. Ninety percent of the producers participating in the program operated a commercial cow/calf enterprise with several producers involved in a combination of commercial cow/calf and purebred cattle or stocker enterprises. A total of 70% of the producers sold less than 50 head of cattle in any one OQBN auction. Since 46% of respondents indicated they owned more than 100 cows, this suggests that many participants marketed only a portion of their calf crop through this system. A total of 90% of producer participants of the 2002 certified sales received a premium price of \$4 per cwt. or more above the regular market price for preconditioned cattle, while only 75% of the producers of the 2001 certified sales received the same amount of premium price. OQBN Buyers perceived they paid a premium price above the regular market price for preconditioned cattle. No statistical difference ( $P > 0.05$ ) was found among the perceived premium price received by producers and the perceived premium price paid by buyers. The premium price, convenience, and other benefits were the main reasons for beef industry stakeholders gave for participating in certified calf sales.

**Key Words:** Extension, Preconditioned Cattle, Certified Calf Sales

#### **44 Mississippi farm to feedlot program: ten-year summary.** J. A. Parish\* and W. B. McKinley, *Mississippi State University, Mississippi State, MS.*

The objectives of the Mississippi Farm to Feedlot program are to evaluate feedlot and carcass performance for steers produced in Mississippi and to provide educational information to Mississippi beef producers regarding retained ownership as a marketing alternative. Ten years (1993-2002) of data were collected and evaluated for feedlot, carcass, and financial performance. Steer carcasses were classified as fitting industry standards (FIT) if hot carcass weight was between 250 and 431 kg, Yield Grade was 3.5 or lower, and Quality Grade was Low Choice or higher or otherwise as not fitting industry standards (NOFIT). Carcass value and net profit per steer were higher ( $P < 0.01$ ) for FIT steers (\$827.70  $\pm$  \$2.55) and (\$48.89  $\pm$  \$3.13), respectively, than for NOFIT steers (\$808.85  $\pm$  \$1.60) and (\$16.56  $\pm$  \$1.94), respectively. Within year of feeding, feed cost of gain (\$99.98  $\pm$  \$0.46 per kg vs \$146.15  $\pm$  \$0.48 per kg), hot carcass weight (373  $\pm$  0.7 kg vs 310  $\pm$  0.8 kg), backfat thickness (1.4 cm  $\pm$  0.02 cm vs 1.1  $\pm$  0.02cm), Yield Grade (3.04  $\pm$  0.02 vs 2.48  $\pm$  0.02) and Quality Grade were higher ( $P < 0.01$ ) and treatment cost (\$17.68  $\pm$  \$1.06 vs \$26.35  $\pm$  \$0.60 per steer) was lower ( $P < 0.01$ ) for steers classified in the top 25% compared to bottom 25% for net profit, respectively. Year of feeding influenced ( $P < 0.01$ ) incidence of sickness, average daily gain, feed cost of gain, hot carcass weight, dressing percent, ribeye area, backfat thickness, yield grade, quality grade, carcass value, and net profit. Net profit from feeding was higher ( $P < 0.01$ ) per steer for steers that were not treated for sickness (\$42.46  $\pm$  \$1.78) than for steers that were treated for sickness (-\$41.78  $\pm$  \$3.76). Steers treated for sickness were younger (283  $\pm$  2.8 d) at feedlot entry ( $P < 0.01$ ) than untreated steers (312  $\pm$  1.3 d). These results indicate that incidence of sickness, feedlot performance, carcass performance, and year of feeding impacted profitability of finishing steers in the Mississippi Farm to Feedlot program.

**Key Words:** Retained Ownership, Feedlot Performance, Carcass Performance

## **Graduate Student Competition**

#### **45 Characterization of leptin levels in *callipyge* sheep.** J. N. Fleming\*<sup>1</sup>, S. P. Jackson<sup>1</sup>, D. H. Keisler<sup>2</sup>, S. J. Schweers<sup>1</sup>, and J. R. Blanton, Jr.<sup>1</sup>, <sup>1</sup>*Texas Tech University,* <sup>2</sup>*University of Missouri.*

The *callipyge* gene is a single polar overdominance mutation that causes muscle hypertrophy in the loin and leg of *callipyge* sheep. When compared to normal sheep, *callipyge* sheep tend to have lower average daily feed intakes, higher feed efficiencies, and leaner carcasses. Leptin is a hormone that is secreted from adipose tissue and has been found to reduce appetite and body fat content when at high levels in the blood. Since *callipyge* sheep exhibit many of the same physiological trends as sheep with high leptin levels, our goal was to evaluate a possible rela-

tionship between these two factors. The objective of this study was to determine blood plasma leptin levels of normal and *callipyge* sheep in different physiological states. This study evaluated blood plasma levels of leptin in normal (n=10) and *callipyge* ewes (n=10), as well as normal (n=10) and *callipyge* lambs (n=10). All ewes were sampled in January during mid-gestation while on an isocaloric ration. All lambs were evaluated at weaning in June (60d of age). Blood was collected via jugular vein puncture into 10mL tubes containing EDTA, centrifuged, and plasma fractions were collected. An ovine specific leptin RIA was used to determine plasma leptin concentrations in all samples. Leptin levels of *callipyge* ewes (5.843 ng/ml) and normal ewes (6.217 ng/ml) did not differ ( $P > 0.78$ ), nor did the *callipyge* lambs (1.337 ng/ml) com-

pared to the normal lambs (1.257 ng/ml;  $P > 0.95$ ). There appears to be no significant relationship between the *callipyge* phenotype and plasma leptin concentrations, but more samples taken during different physiological states are desired.

**Key Words:** Callipyge, Leptin, Sheep

**46 Utilization of chemical treatments to reduce *Escherichia coli* O157:H7 from inoculated cattle manure.** S. L. Krumpelman\*, J. K. Apple, E. B. Kegley, M. G. Johnson, and S. E. Watkins, *University of Arkansas, Fayetteville.*

*Escherichia coli* (*E. coli*) O157:H7 is intermittently shed into the environment by cattle during periods of stress or with certain feeding regimens, which may result in contamination of the hide at the time of harvest and potentially lead to *E. coli* O157:H7 in the food chain. A benchtop trial was conducted to determine the effects of various chemical treatments on the growth of green fluorescent protein labeled *E. coli* O157:H7 inoculated ( $10^7$  cfu/g) into autoclaved cattle manure. Five replications of five chemical treatments were applied: food grade acetic acid, liquid aluminum sulfate, cetylpyridinium chloride (CPC), food grade lactic acid, and granulated sulfuric acid with Fullers earth and crystalline silica. Acetic acid, aluminum sulfate, lactic acid, and sulfuric acid were applied at a rate of 3.6% of the wet manure. The CPC was applied at 1.4% of the wet manure. Liquids were applied by spraying the surface of the manure, while the solid (sulfuric acid) was sprinkled over the surface. Samples were incubated at 37°C. Manure sub-samples were taken at 4, 24, and 48 h for bacterial enumeration and determination of pH and moisture content. There were no treatment by time interactions ( $P > 0.05$ ) for any measurement; however, application of lactic acid and CPC reduced ( $P < 0.03$ ) *E. coli* O157:H7 from the positive control by 1.98 and 1.99  $\log_{10}$  cfu/g, respectively, as compared to reductions of only 1.02, 0.67, and 0.56  $\log_{10}$  cfu/g with aluminum sulfate, sulfuric acid, and acetic acid, respectively. Acetic acid and CPC maintained a higher ( $P < 0.001$ ) pH (7.22 and 7.13, respectively), followed by aluminum sulfate at 6.08, whereas, sulfuric and lactic acid resulted in the lowest ( $P < 0.001$ ) pH (4.68 and 4.42, respectively). Manure treated with sulfuric acid was drier ( $P < 0.03$ ) than the other treatments. The most effective treatments to reduce *E. coli* O157:H7 in cattle manure were CPC and lactic acid.

**Key Words:** *E. coli* O157:H7, Manure Treatment, Pre-Harvest Control

**47 Effect of P.G. 600 on the timing of ovulation in gilts treated with Regu-mate.** B. R. Horsley\*, M. J. Estienne, S. H. Purcell, H. K. Baitis, W. E. Beal, A. F. Harper, and J. W. Knight, *Virginia Polytechnic Institute and State University, Blacksburg.*

We previously reported that ovulation rate, but not pregnancy rate or litter size at d 30 post-mating, was enhanced by gonadotropin treatment (P.G. 600; Intervet America Inc., Millsboro, DE) in gilts fed a progestin (Regu-mate; Intervet America Inc.) compared with gilts receiving progestin alone. We hypothesized that P.G. 600 altered the timing of ovulation, therefore mating gilts 12 and 24 h after first detection of estrus was not the most appropriate breeding regimen. The objective of this study was to determine the effect of P.G. 600 on the timing of ovulation in gilts treated with Regu-mate. Randomly cycling, crossbred gilts (5.5 m of age and 117 kg BW) were fed Regu-mate (15 mg/d) for 18 d. Twenty-four h after Regu-mate withdrawal gilts received i.m. P.G. 600 ( $n = 25$ ) or saline ( $n = 25$ ). Gilts were checked for estrus at 8 h intervals. After first detection of estrus, trans-rectal ultrasonography was performed at 8 h intervals to determine the time of ovulation. Gilts were killed 9 to 11 d after the onset of estrus to determine ovulation rate. All gilts displayed estrus by 7 d after treatment with P.G. 600 or saline. Compared with saline, P.G. 600 increased ( $P = 0.07$ ) ovulation rate ( $14.8 \pm 1.1$  vs.  $17.5 \pm 1.0$ , respectively). Injection-to-estrus ( $98.4 \pm 2.7$  vs.  $110.9 \pm 2.7$  h;  $P < 0.01$ ) and injection-to-ovulation ( $128.6 \pm 2.8$  vs.  $141.9 \pm 3.2$  h;  $P < 0.01$ ) were decreased in gilts treated with P.G. 600 compared with gilts treated with saline. Estrus duration ( $54.4 \pm 2.3$  vs.  $53.7 \pm 2.5$  h;  $P = 0.83$ ), estrus-to-ovulation ( $30.2 \pm 2.0$  vs.  $31.7 \pm 2.2$  h;  $P = 0.62$ ) and time of ovulation as a percentage of duration of estrus ( $55.8 \pm 2.7$  vs.  $57.5 \pm 3.0\%$ ;  $P = 0.67$ ) were similar between groups. In summary, P.G. 600 advanced the onset of estrus and ovulation following termination of Regu-mate treatment and increased ovulation rate. However, treatment

of gilts with P.G. 600 had no effect on the timing of ovulation relative to the onset of estrus.

**Key Words:** Gonadotropin, Ovulation, Progestin

**48 Effects of IGF-1 and -2 on pregnancy associated plasma protein-A (PAPP-A) gene expression in bovine granulosa and theca cells: Assessment by quantitative RT-PCR.** P. Y. Aad\*, C. A. T. Santiago, J. L. Voge, J. R. Malayer, and L. J. Spicer, *Oklahoma State University.*

PAPP-A is a serine metalloprotease capable of cleaving IGFBP-2, -4 and -5, therefore making IGF-1 and -2 available for follicular growth and differentiation. The objective of this study was to determine the effect of IGF-1 and -2 on PAPP-A mRNA levels in small (Sm; 1-5 mm) and large (Lg;  $\geq 8$  mm) follicle granulosa (GC) and theca (TC) cells. SmGC, LgGC and LgTC were collected, cultured in medium containing 10% FCS for 48 h, washed, and then cultured for an additional 24 h in serum free-medium containing 0 or 100 ng/ml of either IGF-1 or IGF-2 for SmGC in experiment 1; 3 or 100 ng/mL of IGF-1, 100 ng/mL of IGF-2, 30 ng/mL of FSH or 100 ng/mL leptin for LgGC in experiment 2; and 0 or 100 ng/mL of either IGF-1 or IGF-2 for LgTC in experiment 3. Total RNA was extracted using the TRIzol® method. Expression levels of PAPP-A were quantified using one-step RT-PCR with TaqMan® Gold RT-PCR Kit; amplifications were performed in an ABI prism® 7700 sequence detection system (Applied Biosystems, Foster City, CA); 18 S rRNA was quantified and used to normalize for RNA loading. Relative mRNA quantification was done using comparative threshold cycle (Ct) method; all values were expressed as fold gene expression  $2^{\Delta\Delta-Ct}$  (relative to the sample exhibiting the highest  $\Delta Ct$  within each experiment). Results show that IGF-1 and -2 did not affect ( $P > 0.10$ ) PAPP-A mRNA levels in SmGC and LgGC. Leptin and FSH did not affect ( $P > 0.10$ ) levels of PAPP-A mRNA in LgGC. However, in LgTC, IGF-2 treatment decreased ( $P < 0.05$ ) PAPP-A gene expression by 39% as compared with the control cultures; IGF-1 was without effect ( $P > 0.10$ ). We conclude that IGF-2 selectively decreases thecal PAPP-A mRNA levels. This may cause a reduction in PAPP-A and its proteolytic action on IGFBPs allowing for less free or bioavailable IGFs in the theca layer for steroidogenesis during growth and selection of follicles.

**Key Words:** Insulin-Like Growth Factor, Thecal Cells, Granulosa Cells

**50 Effects of implant strategy on lipid deposition in finished beef cattle.** K. R. Smith\*, S. K. Duckett, T. D. Pringle, M. G. Gillis, and C. E. Realini, *Animal and Dairy Science Department, University of Georgia, Athens.*

This experiment was conducted to determine the effect of an implant scheme in feedlot cattle on carcass quality and lipid characteristics of subcutaneous (SQ) and intramuscular (IM) depots, and mRNA expression of acetyl CoA carboxylase (ACC), stearoyl CoA desaturase (SCD), and lipoprotein lipase (LPL) in IM adipose tissue. Ten Angus heifers (386 kg), sired by high marbling EPD bulls, were randomly allotted as controls (C) or implanted with Synovex-Plus (SP) at d 0 and 55. At 108 d, all heifers were harvested and a longissimus section (6th to 9th rib) was removed. IM adipose tissue was dissected for mRNA analysis and SQ and IM samples were collected for cellularity determination. At 48 h postmortem, carcass data was collected and a steak was removed for lipid content and fatty acid composition analysis. Data were analyzed using the GLM procedure of SAS with treatment, time and their interaction while cellularity data were analyzed across treatment, tissue and their interaction. Neither total lipid nor major fatty acid concentration (oleic, palmitic, stearic and linoleic) differed ( $P > 0.05$ ) between C and SP. Total cell number, average cell diameter and average cell volume was similar for treatment and tissues ( $P > 0.05$ ). Implant did not alter the amount of IM adipose tissue ACC, SCD, and LPL mRNA ( $P > 0.05$ ). Use of anabolic implants in heifers with genetic potential to marble did not alter ultimate IM lipid content, longissimus composition or expression of IM lipogenic enzymes, thus implantation does not appear to have a direct effect on IM lipid deposition.

**Key Words:** Beef, Implant, Marbling

**51 Melanoma in horses: A review of 245 cases.** C. G. Knehr\*<sup>1,2</sup>, J. L. Robertson<sup>2</sup>, and R. K. Splan<sup>1</sup>, <sup>1</sup>*Department of Animal and Poultry Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia*, <sup>2</sup>*Center for Comparative Oncology, VMRCVM, Virginia Polytechnic Institute and State University, Blacksburg, Virginia*.

Literature and case reports for 245 horses with melanocytic tumors were collected from New Bolton Center in Kennett Square, PA, University of Kentucky Livestock Disease Diagnostic Center in Lexington, KY, Virginia Maryland Regional College of Veterinary Medicine in Blacksburg, VA, and Equine Medical Center in Leesburg, VA to assess potential risk factors. Seventy-two (30%) horses developed benign tumors while 73 (29%) developed malignant tumors. Thirty-six juvenile (< 4 yr), 60 young (4 to 13 yr) and 49 aged (> 13 yr) horses were reported to have benign or malignant tumors (mean = 11.24 yr). Sex predilection for both benign and malignant tumors was 68 males and 77 females. Ninety-two Thoroughbreds, 54 Arabians, 18 Quarter Horses, and 75 non-specified breeds were reported with some degree of tumor activity. Chi-square analyses were performed to investigate relationships between recorded parameters and tumor activity. Aged horses had a significantly greater incidence of malignant tumors (81.6%) relative to young (40%) or juvenile (25%) animals ( $P < .0001$ ). Grey horses had nearly double the amount of malignant tumors than non-grey ( $P < 0.0069$ ) although intraclass tumor levels remained constant. Tumors were more common in areas under the tail or genital region, as well as around the head and neck. Malignancies in the tail/genital (63.4%) region were more prevalent ( $P < .03$ ) than in the hind legs (11.1%) or front legs (22.2%). Also, head/neck region had a higher prevalence of malignant tumors than hind legs ( $P < 0.0100$ ) or abdominal region ( $P < 0.0359$ ). Actual occurrence of malignant tumors is probably higher than that reported in veterinarian facilities due to simple, gross diagnosis of melanocytic tumors in equids. It is suspected that all melanocytic tumors in horses are malignancies. Image analysis and tumor marker detection methods are currently underway to test this belief.

**Key Words:** Equid, Pigment Cell Tumors, Malignant

**52 Effects of feeding a modified yeast cell wall preparation upon the occurrence of fescue toxicosis in mares.** A. I. Orr\*<sup>1</sup>, D. L. Christiansen<sup>1</sup>, B. J. Rude<sup>1</sup>, N. M. Filipov<sup>1</sup>, B. P. Fitzgerald<sup>2</sup>, and P. L. Ryan<sup>1</sup>, <sup>1</sup>*Mississippi State University*, <sup>2</sup>*University of Kentucky*.

Twenty open mares ( $498 \pm 31.5$  kg) were housed in individual stalls located at two barns during a 14 d trial. While in individual stalls, horses were given ad libitum access to non-infected tall fescue hay and water. Additionally, mares were given 6 h/d access to a dry lot for exercise. Mares were arranged in a completely randomized design and offered one of four supplements at 0.8% BW/d: endophyte free (E-); endophyte infected (E+0) with no yeast cell wall preparations (YCW); E+ with 10 g/d of YCW (E+10); or E+ with 20 g/d YCW (E+20). All supplements contained tall fescue seed mixed with a commercially available sweet feed. Seed for all three infected diets (E+0, E+10, and E+20) contained 3,500 ppb ergot alkaloid. Supplements were offered twice daily such that half of the daily YCW intake was mixed at each feeding. Hay intake was not different ( $P > 0.10$ ) among treatments and ranged between 1.2 and 1.3% BW. Total dry matter intake ranged between 2.0 and 2.1% BW and did not differ across treatments ( $P > 0.10$ ). Internal and external body temperature were recorded daily between 0700 and 0800 and did not differ among treatments ( $P > 0.10$ ; ranging from 36.6 to 37.7degC and 17.7 to 30.9degC, respectively). Blood samples were collected every other day and analyzed for serum prolactin and plasma 3, 4 dihydroxyphenylacetic acid concentrations. Serum prolactin concentrations were not different ( $P > 0.1$ ) and ranged between 3.12 and 3.60 ng/ml. Plasma 3,4 dihydroxyphenylacetic acid concentrations were not different ( $P > 0.1$ ) among treatments and ranged between 4.81 and 5.86 ng/ml. No differences were found for intake, body temperature, or blood metabolite concentration for horses consuming infected fescue or non-infected fescue. This may explain why horses supplemented with yeast cell wall preparation up to 20 g/d did not differ from horses not receiving yeast cell wall preparation while consuming infected fescue.

**Key Words:** Equine, Fescue Toxicosis, Yeast Cell Wall

**53 Forage intake and performance of early-weaned calves grazing rye-ryegrass pastures and receiving three levels of supplementation.** J. M. B. Vendramini\*<sup>1,2</sup>, L. E. Sollenberger<sup>1</sup>, J. D. Arthington<sup>2</sup>, and J. D. Debeux, Jr.<sup>1</sup>, <sup>1</sup>*University of Florida, Department of Agronomy*, <sup>2</sup>*University of Florida, Range Cattle Research and Education Center*.

Early calf weaning at the start of the breeding season increases the likelihood that first-calf heifers will rebreed, but there is little information regarding pasture-based feeding programs for the early-weaned calf. The objective of this experiment was to evaluate the effect of three levels of supplementation on forage intake and performance of early weaned calves grazing rye (*Secale cereale*)- ryegrass (*Lolium multiflorum*) pastures in Gainesville-FL from 26 Jan. to 14 May 2003. Treatments were three levels of concentrate (1.0, 1.5 and 2.0% of BW) arranged in three replicates of a completely randomized design. Two, 90-d-old Angus-Brahman crossbred early-weaned calves (1 steer and 1 heifer) were assigned to each pasture. The pastures were 0.2 ha subdivided into four paddocks for rotational stocking (7-d grazing period, 21-d rest period) using a variable stocking rate to maintain similar herbage allowance among treatments. Calves were weighed on 28-d intervals. Herbage mass was measured every 14-d using a disk-plate meter with samples collected in duplicate. Hand-plucked samples were collected every 14 d and analyzed for in vitro organic matter digestibility (IVOMD). Forage intake was measured using a controlled-release Cr bolus. Forage intake decreased ( $P < 0.05$ ) linearly with increasing supplementation level (2.3, 1.6 and 1.2% BW for 1.0, 1.5 and 2.0% BW supplementation treatments, respectively). Average stocking rate increased ( $P = 0.01$ ) from 4 animal units/ha (500 kg/ha) on 1.0% pastures up to 4.8 animal units/ha on 2.0% pastures (SEM = 0.08). Gain per hectare increased ( $P = 0.03$ ) linearly from 742 to 990 kg ha-1 as supplementation rate increased (SEM = 37.7). Herbage IVOMD did not differ ( $P = 0.47$ ) among treatments (average IVOMD = 84.5%; SEM = 0.55). The ideal level of concentrate supplementation of early-weaned calves will be dependent upon availability of forage, price of concentrate and calf market value prices.

**Key Words:** Weaning, Feed Intake, Calves

**54 Physiological indicators of performance and feed efficiency traits in growing steers and bulls.** E. G. Brown\*<sup>1</sup>, G. E. Carstens<sup>1</sup>, J. T. Fox<sup>1</sup>, K. O. Curley, Jr.<sup>1</sup>, T. M. Bryan<sup>1</sup>, L. J. Slay<sup>1</sup>, T. H. Welsh, Jr.<sup>1</sup>, R. D. Randel<sup>2</sup>, J. W. Holloway<sup>3</sup>, and D.H. Keisler<sup>4</sup>, <sup>1</sup>*Texas Agricultural Experiment Station, College Station*, <sup>2</sup>*Texas Agricultural Experiment Station, Overton*, <sup>3</sup>*Texas Agricultural Experiment Station, Uvalde*, <sup>4</sup>*University of Missouri*.

Discovery of physiological indicators that are predictive of performance and efficiency traits would be useful as early screening tests to cost effectively identify more efficient animals. This study examined phenotypic correlations between potential physiological indicators, and growth and feed efficiency traits. Braunvieh crossbred steers (Experiment 1, n=112) and Bonsmara bulls (Experiment 2; n=62) were individually fed roughage-based diets using Calan gate feeders. Following a 30-d adaptation period, individual BW and DMI were measured weekly for 70 d and RFI calculated as the residual value from linear regression of DMI on mid-test BW<sup>0.75</sup> and ADG. Low RFI steers and bulls were 18.6% and 21% more efficient ( $P < 0.001$ ) than high RFI steers and bulls, respectively. Blood samples were collected on d 0 and 70 to measure cortisol, leptin, triiodothyronine ( $T_3$ ), thyroxine ( $T_4$ ), and insulin-like growth factor-I (IGF-I). In steers, d-0 cortisol concentrations were negatively correlated ( $P < 0.01$ ) with DMI ( $r = -0.23$ ) and ADG ( $r = -0.30$ ), and positively correlated ( $P < 0.05$ ) with feed conversion ratio (FCR;  $r = 0.18$ ), but not RFI. However, cortisol concentrations were not correlated with DMI, ADG, RFI or FCR in bulls. Day-0 and -70 leptin concentrations in steers and d-0 leptin concentrations in bulls were not correlated with growth and efficiency traits. Day-70 leptin concentrations in bulls were correlated ( $P < 0.05$ ) with DMI ( $r = 0.26$ ) and ADG ( $r = 0.32$ ), but not with efficiency traits. In steers,  $T_3$  was correlated ( $P < 0.05$ ) with FCR ( $r = 0.20$ ) and ADG ( $r = -0.16$ ) on d 0, but not on d 70. In bulls,  $T_3$  was not correlated with these traits. Day-0  $T_4$  concentrations were negatively correlated ( $P < 0.05$ ) with ADG in steers and bulls ( $r = -0.16$ ;  $-0.28$ , respectively), and positively correlated with FCR ( $r = 0.16$ ) in steers only. In steers and bulls, d-0 IGF-I concentrations were positively correlated ( $P < 0.05$ ) with DMI ( $r = 0.17$ ,  $0.29$ ), FCR ( $r = 0.19$ ,  $0.36$ ), and RFI ( $r = 0.22$ ,  $0.38$ ), respectively. Low RFI (more

efficient) steers and bulls had 29.0% and 24.8% lower d-0 IGF-I concen-

trations ( $P < 0.05$ ) than high RFI bulls and steers, respectively. These results suggest that IGF-I may be a useful physiological indicator of RFI in growing cattle.

**Key Words:** Beef Cattle, Residual Feed Intake, Growth

## Meats

**55 Chemical, fatty acid and sensory characteristics of beef from cattle grazing forages supplemented with soyhulls vs. USDA Choice and Select beef.** R. T. Baublits<sup>\*1</sup>, F. W. Pohlman<sup>1</sup>, A. H. Brown, Jr.<sup>1</sup>, Z. B. Johnson<sup>1</sup>, D. O. Onks<sup>2</sup>, D. C. Rule<sup>3</sup>, B. A. Sandelin<sup>1</sup>, and C. M. Murrieta<sup>3</sup>, <sup>1</sup>University of Arkansas, <sup>2</sup>University of Tennessee, <sup>3</sup>University of Wyoming.

Increased concerns for a healthier diet have spurred interests in forage-fed beef due to proportions of fatty acids that have exhibited a healthy impact when incorporated into a human dietary regimen. Supplementing concentrates to cattle on a forage ration can improve palatability, but can negatively impact the healthier fatty acid profile associated with a forage ration. Therefore, over two consecutive years, steaks from cattle ( $n = 107$ ) grazing three cool season grazing systems consisting of either orchardgrass pasture or fescue pasture, each with soyhull supplementation, or fescue pasture with no supplementation for a control were compared with USDA Choice and Select steaks obtained from area supermarkets for chemical, fatty acid and sensory characteristics. Steaks from all three forage treatments had greater ( $P < 0.05$ ) proportions of longissimus conjugated linoleic acid (CLA; cis-9, trans-11) and lower ( $P < 0.05$ ) n-6 to n-3 fatty acid ratios than USDA Choice or Select steaks. Supplementing soyhulls did not decrease ( $P > 0.05$ ) the proportion of longissimus CLA, and sensory evaluation revealed that the supplemented treatments had improved ( $P < 0.05$ ) beef/brothy and grassy characteristics when compared to the control. These results suggest supplementing soyhulls to cattle on forage can improve sensory characteristics without dramatically hindering the fatty acid profile associated with forage-fed beef.

**Key Words:** Beef, Fatty Acid, Sensory

**56 Effects of supplemental manganese on pork quality of growing and finishing swine.** A. W. Tittor<sup>\*1</sup>, J. K. Apple<sup>2</sup>, and J. B. Morgan<sup>1</sup>, <sup>1</sup>Oklahoma State University, <sup>2</sup>University of Arkansas.

In order to investigate the impact of manganese (Mn) on pork quality 168 pigs were randomly assigned to one of six dietary treatments consisting of: 1) no Mn in the premix (CON), 2) no Mn in premix with MnSO<sub>4</sub> (MnSO<sub>4</sub>) in diet, 3) no Mn in premix with AvailaMn (AMn) in diet, 4) Mn in premix (Mn), 5) Mn in premix and MnSO<sub>4</sub>(MnN+MnSO<sub>4</sub>), and 6) Mn in premix and AvailaMn (Mn+AMn). After obtaining the pre-determined finished live weight, ( $\geq 113$  kg), animals were harvested at a commercial processing facility utilizing humane harvest processes. Following 24 h of chilling (1°C), carcass measurements were collected and loins were fabricated and shipped to the Oklahoma State University Meat Laboratory. After removing blade and sirloin portions of each loin, the remaining portion (ribs 5 through 13) were fabricated into chops (2.54 cm thick), weighed and allowed to bloom for 15 min. Lean color, firmness and marbling scores were evaluated. Chops were placed in a modified atmosphere package (80% O<sub>2</sub>/ 20% CO<sub>2</sub>) for shelf life evaluation, purge loss and estimates of lipid oxidation using the thiobarbituric acid (TBA) analysis were conducted. Carcasses from pigs supplemented with diets containing Mn (Mn, Mn+MnSO<sub>4</sub> and Mn+AMn) tended to exhibit heavier carcass weights ( $P = 0.10$ ) and larger loin eye muscle depth at the 10th rib ( $P = 0.03$ ) than other carcasses from remaining dietary treatments. Longissimus muscle chops from Mn+MnSO<sub>4</sub> pigs displayed brighter ( $P < 0.05$ ) lean color scores compared to other treatment groups. When comparing diets containing MnSO<sub>4</sub> produced carcasses having chops with more desirable ( $P < 0.05$ ) overall appearance scores compared to chops from remaining dietary treatments. A significant interaction was evident for lean discoloration scores in that less surface browning was observed over the later (d 5-7) days of display for chops originating from pigs fed diets that contained Mn+MnSO<sub>4</sub>. No differences ( $P > 0.05$ ) were observed in TBARS for any dietary treatments. These findings suggest that supplementing swine diets with

Mn+MnSO<sub>4</sub> improved lean color and surface browning stability during retail display.

**Key Words:** Pork, Manganese, Color

**57 Effects of dietary fat source on performance and carcass composition of growing-finishing swine.** J. K. Apple<sup>\*</sup>, C. V. Maxwell, L. K. Rakes, J. D. Stephenson, Z. B. Johnson, W. A. Wallis, and S. Hutchison, *University of Arkansas.*

Crossbred pigs ( $n = 288$ ) were used to test the effects of dietary fat source on the performance and carcass composition of growing-finishing swine. Pigs were blocked by weight, allotted to pens (4 pens/block), and, within blocks, pens (8 pigs/pen) were randomly assigned to either control corn-soybean meal starter (27.2 to 45.5 kg), grower-I (45.5 to 68.0 kg), grower-II (68.0 to 90.9 kg) and finisher (90.9 to 113.6 kg) diets, or diets containing 4% beet tallow (BT), poultry fat (PT), or soybean oil (SBO). Immediately prior to feeding experimental diets, one pig from each pen was randomly selected, slaughtered, and right sides of carcasses were dissected into lean, fat, bone, and skin components. Subsequently, one pig from each pen was randomly selected for slaughter and carcass dissection at a mean pen weight of 45.5, 68.0, 90.9, and 113.6 kg. Inclusion of fat into swine diets had no ( $P > 0.10$ ) effect on ADG, ADFI, or gain:feed (G:F) during the starter, grower, or finisher periods, regardless of fat source. Neither carcass weights nor dressing percentage were affected ( $P > 0.10$ ) by dietary fat source. Carcasses from pigs fed BT, PF, and SBO had greater ( $P < 0.05$ ) average backfat depths than carcasses from pigs fed the control diets; however, dietary fat source had no ( $P > 0.10$ ) effect on carcass composition. As expected, carcass lean yield was highest ( $P < 0.05$ ) for pigs slaughtered at 27.2 kg, whereas lean yield was lowest ( $P < 0.05$ ) in carcasses of pigs slaughtered at 90.9 and 113.6 kg. Total carcass fat yield was different ( $P < 0.05$ ) at each slaughter weight, increasing from 7.1% at 27.2 kg to 24.2% at 113.6 kg. Carcass bone yields were highest (20.3%;  $P < 0.05$ ) for pigs slaughtered at 27.2 kg, and lowest (15.3%;  $P < 0.05$ ) for pigs slaughtered at 113.6 kg. Total carcass skin yields were similar ( $P > 0.05$ ) among pigs slaughtered at 27.2, 45.5, and 68.0 kg; however, pigs slaughtered at 90.9 and 113.6 kg had lower ( $P < 0.05$ ) percentages of skin than carcasses of pigs slaughtered between 27.2 and 68.0 kg. Results of the present study indicate that dietary fat source has no impact on live performance or carcass composition of growing-finishing swine.

**Key Words:** Carcass Composition, Fat Source, Swine

**58 Effects of iron supplementation level on performance and carcass characteristics of growing-finishing swine.** J. K. Apple<sup>\*1</sup>, W. A. Wallis<sup>1</sup>, C. V. Maxwell<sup>1</sup>, L. K. Rakes<sup>1</sup>, and T. M. Fakler<sup>2</sup>, <sup>1</sup>University of Arkansas, <sup>2</sup>Zinpro Corporation.

Crossbred barrows and gilts ( $n = 210$ ) were used to test the effects of iron (Fe) supplementation level on performance and carcass characteristics of growing-finishing swine. Pigs were blocked by BW, allotted to pens (5 to 6 pigs/pen), and pens (5 pens/block) were allotted randomly to either negative control (NC) corn-SBM starter, grower, and finisher diets devoid of Fe in the vitamin-mineral premix, positive control (PC) corn-SBM starter, grower and finisher diets with Fe included in the vitamin-mineral premix, or PC diets supplemented with 50, 100, or 150 ppm of Fe from AvailaFe (an Fe-amino acid complex). When the lightest block averaged 118.2 kg, pigs were harvested, and bone-in pork loins were captured during fabrication. During the starter phase, ADG decreased linearly ( $P < 0.02$ ) as supplemental Fe increased from 0 (PC) to 150 ppm; however, during the grower-I phase, ADG tended to increase linearly ( $P < 0.10$ ) as Fe increased in the diet. Neither ADFI nor G:F were affected ( $P > 0.10$ ) by Fe supplementation during the starter and grower-I phases, and pig performance was similar ( $P > 0.10$ ) among treatments during the grower-I and finisher phases, as well as over the entire trial. Carcass muscling and fatness measures, as well

as fat-free lean yields, were not ( $P > 0.10$ ) affected by supplemental Fe. Ultimate (48-h) pH of the longissimus muscle (LM) increased linearly ( $P < 0.04$ ) with increasing levels of supplemental Fe. Furthermore, subjective color scores increased linearly ( $P = 0.03$  and  $0.10$  for NPPC and Japanese color scores, respectively) with increasing supplemental Fe, whereas the LM tended to become darker (lower  $L^*$  values;  $P = 0.08$ ) as supplemental Fe increased from 0 to 150 ppm. Iron supplementation had no ( $P > 0.10$ ) effect on drip loss percentage, marbling or firmness scores, and  $a^*$  and  $b^*$  values. Even though ADG was affected during the early feeding phases, increasing dietary Fe had no appreciable effects on pig performance or carcass composition. Modest improvements in pork color suggest that supplementing swine diets with 150 ppm of Fe from AvailaFe may enhance pork quality.

**Key Words:** Iron, Performance, Pork Quality

### 59 Adipocyte size distribution in different fat depots in kids receiving fish oil supplemented diet. P. T. Marinova, V. B. Banskalieva\*, and V. L. Tzvetkova, *Institute of Animal Science*.

A study was conducted to investigate the effect of fish oil on the average size distribution of adipocytes from different fat depots - caudal, perirenal, intermuscular and intramuscular (*m. longissimus dorsi*, *m. semimembranosus* and *m. supraspinalis*) adipose tissue of kids. Two groups of 5 male kids (age 3 months) each of local Bulgarian White goats were fed for 21 days iso-nitrogenous diets, containing either no added fat (control) or sunflower oil, added at 2.5% of wet weight of concentrate. Dietary fish oil did not influence the average diameter of fat cells of perirenal and intermuscular adipose tissues, whereas the average diameter of fat cells in *m. longissimus dorsi*, was increased by 59% ( $p < 0.01$ ). Fish oil supplemented diet had a noticeable effect on the average size distribution of adipocytes in the different fat depots. The relative part of cells of large diameter increased in caudal, perirenal and intramuscular (*m. longissimus dorsi*, *m. semimembranosus* and *m. supraspinalis*). The higher weight of caudal ( $p < 0.01$ ) in the experimental animals was accompanied with decreased formation of population of smaller adipocytes, whereas the majority of cells remained unchanged. In spite of the tendency of higher deposition of perirenal fat, the majority of cells slightly decreased. A decrease of the majority cells was observed in the intermuscular adipose tissue as well. The enrichment of *m. longissimus dorsi*, of more fat after fish oil treatment leads to a drastic reduction of the majority cells of small diameter and a concomitant increase of those of bigger ones. Similar tendencies, but to a lower extent, were observed in the average size distribution of fat cells in *m. semimembranosus* and *m. supraspinalis*. The data obtained indicate that the effect of fish oil (rich in very long polyunsaturated fatty acids EPA and DHA) on the adipocyte size distribution and fat deposition varies among the depots in a depot-specific fashion.

**Key Words:** Fish Oil, Adipocytes, Size

### 60 Predicting beef tenderness using near infrared spectroscopy. S. Rust, J. B. Morgan, S. Jeyamkondan, G. Kranzler, and C. Raines\*, *Oklahoma State University*.

The objective of this multiple phased study was to determine the accuracy of a on-line near-infrared spectral reflectance system to predict 14 d aged, cooked beef tenderness. In Phase I, 278 carcasses (133 Select and 145 Choice carcasses) were selected from two commercial plants and scanned in the Oklahoma State University meat laboratory. Following the scanning process, longissimus steaks (2.54 cm) were fabricated and aged in refrigerated conditions ( $1^{\circ}\text{C}$ ) for 14 d. In Phases II and III, 476 carcasses (258 Select and 218 Choice) were scanned immediately following USDA quality determination in each of two regional beef processing facilities. Identical to the initial phase, strip loin steaks were fabricated and aged for 14 d. Following postmortem aging, all steaks were cooked to a final internal temperature of  $70^{\circ}\text{C}$ . Slice shear force was measured after the steaks were allowed to chill to  $4^{\circ}\text{C}$ . Of the Phase I and II samples, 39 (6.77%) were categorized as "tough" (i.e.,  $\geq 25$  kg slice shear force after 14 d of postmortem aging). Of the 39 "tough" samples, 20 (3.7% error rate) were correctly placed in the 90% certification level. Another 10 "tough" samples were placed in the 80% certification level (2.0% error rate). The difference in mean longissimus slice shear force value (2.67 kg) between certified "tender" and not certified was significant ( $P < 0.05$ ) for spectral analysis. Removing the toughest 10% improved the mean slice shear force in excess of 6.5 kg. A

similar trend was observed, in that predicted tough samples were removed from the population, improvements were made in the certified tender population. Using steaks from Phase III, a third party verification stage that included sending 200 ribeye steaks (100 USDA Select and 100 USDA Choice) to the Meat Animal Research Center (MARC) for slice shear force measurements. The scan values from the spectrometer were compared to the slice shear force values to evaluate accuracy. The magnitude of difference was not greatly improved after the toughest 40% (60% certified as tender) was segmented as not certified. This has some wonderful opportunities, in that sorting can be accomplished for branded beef programs which would guarantee tender beef and lead to enhanced eating experiences.

**Key Words:** Beef, Tenderness, Infrared

### 61 Impact of subprimal enhancement on postmortem aging and retail shelf life characteristics of fresh beef. I. R. Shann\*, J. B. Morgan, and F. K. Ray, *Oklahoma State University*.

A study was conducted to examine the tenderness and shelf life characteristic of beef subprimals with an industry utilized solution containing salt, phosphate, and rosemary oleoresin. USDA Choice and Select beef carcasses ( $n = 20$  each) were identified at random and paired samples ( $n = 20$  pairs) of USDA Choice and Select strip loins (IMPS #180), shoulder clods (IMPS #114), and top sirloin butts (IMPS #184) were individually identified prior to carcass disassembly. One-half of the subprimals were enhanced at 110% of their original weight with a solution and allowed to equilibrate for 1 h post-enhancement. Steaks ( $n = 7$ ) were fabricated from subprimals and randomly allocated for 7 post-mortem aging periods (1, 3, 6, 9, 12, 15, and 18d). Upon conclusion of each storage period, each steak was then frozen ( $-20^{\circ}\text{C}$ ) so the steaks could be simultaneously evaluated for tenderness utilizing WBS measurements. Additional USDA Choice and Select beef carcasses ( $n = 15$ ) were identified at random. In a similar manner, paired samples of USDA Choice and Select strip loins, shoulder clods, and top sirloin butts were individually identified and randomly assigned to six treatments which included enhanced and non-enhanced subprimals, which were aged for 7, 14, or 21 d. At the conclusion of each storage period, subprimals were fabricated into steaks (2.54 cm), packaged in a modified atmosphere package (80% $\text{O}_2$ /20% $\text{CO}_2$ ) and displayed in retail cases to determine the effects of storage time and enhancement on shelf life. Enhanced strip loin steaks were more tender ( $P < 0.05$ ) than non-enhanced steaks at all storage periods. Steaks from subprimals that were stored for longer periods had inferior ( $P < 0.05$ ) retail-display characteristics and a shorter ( $P < 0.05$ ) shelf life than steaks from shorter storage periods. Furthermore, as steaks were displayed for longer periods, retail-display characteristics declined ( $P < 0.05$ ). Also, samples obtained from enhanced samples displayed significantly less lipid oxidation ( $P < 0.05$ ) than did non-enhanced samples. These findings suggested that enhancing beef subprimals eliminated the need for postmortem aging in order to acquire acceptable tenderness and retail display characteristics.

**Key Words:** Beef, Tenderness, Color

### 62 Use of a carbon monoxide packaging system in improving retail characteristics of "compromised" beef cuts. K. Henry<sup>1</sup>, J. B. Morgan, J. Duggin<sup>1</sup>, and M. Fransreb<sup>2</sup>, <sup>1</sup>Oklahoma State University, <sup>2</sup>Cryovac/Sealed Air Corp.

Short loins ( $n=14$ ) and top sirloin butts ( $n=14$ ) were obtained and aged for 14 d at Oklahoma State University Food and Agricultural Products Center. The subprimals were then over-night mailed to Cryovac Sealed Air Corporation (Duncan, SC) for further processing. Twelve steaks were cut for the following procedures: lean color assessment; odor assessment; cooked internal lean color; thiobarbituric acid analysis and total plate count; drip loss; and sensory panel. Steaks were then divided into one of three modified atmosphere packaging treatments: 80%  $\text{O}_2$ /20%  $\text{CO}_2$  (80/20), 70%  $\text{N}_2$ /30%  $\text{CO}_2$  (70/30), or 69.6%  $\text{N}_2$ /30%  $\text{CO}_2$ /0.4%  $\text{CO}$  (CO). The meat trays were sealed with 1050 lidding film (Cryovac Sealed Air, Duncan, SC) for packages with the atmosphere treatment of 80/20, and Cryovac lid 550 peelable film for the atmosphere treatments of 70/30 and CO. Ground beef patties were prepared, and subjected to the same procedures and gas treatments as the steaks. Packages were then subjected to dark stored for 0, 7, or 14 d. Random steaks/patties were removed for each packaging treatment group and were placed in retail display for 7 days. CO displayed brighter lean

color ( $P < 0.05$ ), which improved total retail display time compared to 80/20 and 70/30 for steaks and ground beef patties, especially following 7 days of dark storage. CO also reduced ( $P < 0.05$ ) bone discoloration in T-bone steaks compared to gas treatments of 80/20 and 70/30. CO packaged steaks did create a hard to cook phenomenon in ground beef patties. The patties remained persistent pink even after being cooked to 77°C (well done). The inclusion of CO also reduced lipid oxidation compared to other treatments. Trained sensory panelists could not distinguish CO packaged products from samples in 70/30, and found them more acceptable in their flavor profile than 80/20. Thus, CO appears to extend shelf life, while slowing rancidity, which will be conducive to the typical distribution situation seen in the United States.

**Key Words:** Beef, Shelf Life, Carbon Monoxide

### 63 Some effects of marinating and *sous vide* cooking on the production of value-added beef pot roasts. J. M. Martin\*, J. L. Herring, and R. W. Rogers, *Mississippi State University*.

The production of high quality, value-added precooked beef pot roasts provides consumers with additional choices when purchasing beef products. This study was conducted to investigate the effects of marinating combined with *sous vide* cooking on Warner-Bratzler Shear (WBS) values and sensory attributes of selected beef muscles. Previously frozen intact *gluteus medius* muscles obtained from the MSU Meats Laboratory were defrosted and injected 12% above their fresh weight with various

marinades. The injected muscles were marinated 17 h, portioned into approximately 0.46 kg individual roasts and *sous vide* cooked in an 85°C water bath for 7 h after an internal core temperature of 82°C was reached. Product internal temperature was monitored using a digital thermometer with the thermocouple inserted into the geometric center of a roast. The cooked roasts were stored at 2.2°C until evaluated 5 d later. The roasts were reheated in a water bath to 71°C internally and presented for WBS and sensory panel evaluation. WBS values for marinated roasts ranged from 7.37 kg to 8.72 kg. Marinating positively affected ( $P < 0.05$ ) tenderness, juiciness and overall acceptability ratings as determined by sensory panelists. Sensory panelists detected no significant flavor or appearance differences ( $P > 0.05$ ) between marinated roasts. The control roasts, which were cooked the same way but not marinated, received lower ( $P < 0.05$ ) sensory panel ratings for flavor, tenderness, juiciness and overall acceptability. A companion pilot study using the same methodology except utilizing the *biceps femoris* muscle from an E maturity bull was conducted to validate the effectiveness of the marinating and cooking processes previously used. As *sous vide* cooking time increased, WBS values decreased from 20.91 kg to 5.48 kg reaching the latter WBS value after 7 h of cooking. Sensory panelists concurred as tenderness ratings improved ( $P < 0.05$ ) with increased cooking time. Therefore, utilizing a combination of marinating and cooking techniques can consistently produce value-added precooked beef pot roasts that are tender and flavorful, even from meats that are not generally considered to be acceptable for producing roast beef.

**Key Words:** Marinating, Beef Pot Roasts, Value-Added

## Physiology, Swine Physiology, Undergraduate Competition & Teaching

### 49 Behavior of pregnant gilts and sows in crates or pens fed either by a single drop or by trickle feeding. L. E. Hulbert\*<sup>1</sup>, J. L. Morrow<sup>2</sup>, J. Dailey<sup>2</sup>, and J. J. McGlone<sup>1</sup>, <sup>1</sup>*Pork Industry Institute, Texas Tech University*, <sup>2</sup>*Livestock Issues Research Unit, USDA-ARS*.

Ninety-four Camborough-22 (PIC USA) gilts and sows in mid gestation were used to determine the effects of two penning systems (crates vs. pens of 5) and feeding systems (drop fed vs. trickle fed) on behavior for 2 parities. The four treatments were arranged in a 2 X 2 factorial. Sows were fed 2.7 kg at 0730 h with Drop-fed receiving their meal in a single drop and Trickle-fed over a 30 min period. Gilts were randomly assigned to their initial treatments and for their subsequent parity they were returned to original treatments. Behavioral measures were collected from time lapse video recordings made over a 24-h period. Behaviors included standing, lying, sitting, drinking, feeding, and oral/nasal/facial (ONF) behaviors. The statistical model was a randomized complete block design with a 2 X 2 factorial arrangement of treatments; four complete blocks and a split-split plot over parity and time of day. Overall durations and frequencies of behaviors were statistically similar ( $P > 0.10$ ) for all treatment main effects. However, there were significant interactions among periods and treatments with most sows being inactive at night and treatments causing different patterns of activity during the day. Crated-Drop fed sows had a higher duration of ONF during the 0800h to 1200h periods ( $P = 0.02$ ) than sows in other treatments. Subsequently, the crated-Drop-fed sows spent less time lying down during the same periods ( $P = 0.01$ ). Sows displayed low frequency and duration of agonistic behaviors. Pregnant gilts and sows in the traditional Drop-crate system would reduce ONF behaviors if they were either trickle-fed or kept in a social group. Few behavioral problems were observed among penned or crated sows.

**Key Words:** Sow Housing, Welfare, Behavior

### 65 Effects of fasting and development on leptin and PPAR $\gamma$ gene expression in various fat depots. C. W. O'Gorman\*, Y. Matsumoto, and M. R. Garcia, *Texas A&M University-Kingsville, Department of Animal and Wildlife Sciences, Kingsville, TX*.

The relationship between fasting and development on leptin and peroxisome proliferator activator receptor gamma (PPAR $\gamma$ ) gene expression in visceral and subcutaneous fat was determined in gilts. Twelve cross-bred, intact prepubertal gilts (PP; 132.2  $\pm$  4.1 d of age, 70  $\pm$  1.8 kg), and 12 intact pubertal gilts (P; 227.3  $\pm$  6.4 d of age, 131.6  $\pm$  4 kg) were utilized. At the onset of the study, 0 hr (mid-luteal stage of the estrous cycle in P), BW was recorded, blood samples were collected, and animals were randomly allocated to either 1 of 2 treatment groups: Control (C), ad libitum fed (PP, n=6; P, n=6), or Fasted (F; PP, n=6, P n=6) for 72 hr. After 72 hr, BW was recorded, blood samples were collected, and gilts were euthanized. Subcutaneous (s) fat, from the abdominal region, pelvic (p) fat, kidney (k) fat, and heart (h) fat (P gilts only) were collected for analysis of leptin and PPAR $\gamma$  mRNA using real-time RT-PCR. ADG was calculated and serum metabolites were measured. Body weight and ADG decreased ( $P < 0.03$ ) over 72 hr in the FP gilts. Although a significant decrease in BW did not occur in FPP gilts, ADG (-2.5  $\pm$  0.1 kg) did decrease ( $P < 0.01$ ). Serum concentrations of glucose did not differ relative to treatment or development, but serum triglyceride concentrations, independent of development, were greater ( $P < 0.01$ ) in F gilts after 72 hr (157.6  $\pm$  4.8  $\mu$ mol/L, 0 hr vs. 181.8  $\pm$  7.3  $\mu$ mol/L, 72 hr) compared to C gilts (161.7  $\pm$  3.5  $\mu$ mol/L, 0 hr vs. 171.1  $\pm$  3.6  $\mu$ mol/L, 72 hr). Neither fasting nor stage of development affected leptin mRNA in s fat; however, PPAR $\gamma$  mRNA tended ( $P = 0.07$ ) to decrease in s fat of all F gilts. Both leptin and PPAR $\gamma$  mRNA tended ( $P < 0.1$ ) to decrease in p fat of all F gilts. A decrease ( $P \leq 0.03$ ) in leptin mRNA occurred in k fat of all F gilts and h fat, FP only; however, PPAR $\gamma$  mRNA only tended ( $P = 0.06$ ) to decrease in h fat of FP gilts. Hence, fasting, independent of development, differentially regulates adipocyte leptin gene expression relative to fat depot and tends to decrease PPAR $\gamma$  gene expression regardless of fat depot.

**Key Words:** Leptin, PPAR, Fat

### 64 Invited Paper: A reevaluation of measures of boar fertility. B. Flowers\*, *North Carolina State University*.

Abstract not available.

**66 Dehydroepiandrosterone-sulfate (DHEAS) enhances *in vitro* lymphocyte function and improves immunization response in pigs.** N. Burdick<sup>\*1</sup>, J. Dominguez<sup>1</sup>, T. H. Welsh, Jr.<sup>2</sup>, and J. C. Laurenz<sup>1</sup>, <sup>1</sup>Texas A&M University-Kingsville, <sup>2</sup>Texas A&M University, College Station.

Crossbred, female pigs ( $n = 8$ ; initial weight  $49 \pm 2$  kg) were assigned by weight to one of two treatments ( $n = 4$  pigs / treatment) and fed either 0 (Control) or 1 mg DHEAS / kg body weight (Supplemented) twice daily (0800 and 1600 h) for 6 weeks. One week after the initiation of treatments, all pigs were immunized against keyhole limpet hemocyanin and ovalbumin (1 mg/ml each emulsified in Freund's incomplete adjuvant). Blood samples were taken initially and at weekly intervals following the initiation of treatments and total WBC, WBC differential counts and serum concentrations of immunoglobulin G (IgG) determined. In addition, on weeks 1, 3 and 6 of the experimental period lymphocytes were isolated from peripheral blood by density gradient centrifugation and the *in vitro* response to Concanavalin A (ConA) assessed. As expected immunization resulted in time-dependent increases ( $P < 0.01$ ) in WBC and serum IgG concentrations with maximal increases ( $P < 0.05$ ) occurring 2 and 3 weeks post-immunization, respectively. Although not effecting ( $P > 0.10$ ) the increase in WBC, supplementation of pigs with DHEAS augmented antibody production in response to immunization as indicated by greater ( $P < 0.05$ ) peak serum concentrations of IgG ( $18.4 \pm 2.3$  vs.  $28.9 \pm 2.2$  mg/mL for Control vs. Supplemented). As expected, ConA induced dose-dependent increases ( $P < 0.01$ ) in proliferation and IgM production in cultured lymphocytes with initial increases apparent at 0.3 ug/ml and maximal effects occurring at 2.5 ug/ml ConA. Consistent with the affects seen *in vivo*, lymphocytes isolated from supplemented pigs demonstrated an enhanced ( $P < 0.05$ ) proliferative response ( $0.60 \pm 0.04$  vs.  $0.49 \pm .03$  O.D. at 562 nm for Supplemented vs. Control, respectively) and increased ( $P < 0.05$ ) IgM production ( $2576 \pm 177$  vs.  $2121 \pm 139$  ng/mL for Supplemented vs. Control, respectively) in response to ConA. Collectively, these results indicate that oral administration of DHEAS can enhance the responsiveness of lymphocytes to antigenic challenge and suggest that DHEAS may be beneficial to enhance immune function in the pig.

**Key Words:** Immunity, Immunomodulation

**67 Porcine endometrial nitric oxide synthase gene expression and uterine nitric oxide content during estrous cycle and early pregnancy.** J. L. Roberts<sup>\*1</sup>, J. W. Ross<sup>1</sup>, M. D. Ashworth<sup>1</sup>, J. R. Malayer<sup>2</sup>, and R. D. Geisert<sup>1</sup>, <sup>1</sup>Dept. Animal Science, Oklahoma State University, <sup>2</sup>Dept. Physiological Sciences, Oklahoma State University.

Nitric oxide (NO) is a product of L-arginine oxidation catalyzed by multiple isoforms of nitric oxide synthase (NOS). In many mammalian species, NO acts as a potent vasodilator, promoting angiogenesis during implantation. In the pig, which has a diffuse type epitheliochorial placenta, the role of NO during early gestation is not well defined. The objective of the present study was undertaken to characterize the NO system during the estrous cycle and early pregnancy in the pig. Endometrium and uterine flushings were collected from uteri of cyclic (D 0, 5, 10, 12, 15, and 18) and pregnant gilts (D 10, 12, 15, and 18). Endometrial total RNA was utilized for quantitative RT-PCR gene expression analysis of inducible (iNOS) and endothelial NOS (eNOS). Total NO in uterine flushings was quantified using a colorimetric assay. The PROC MIXED procedures were utilized to evaluate the effect of status, day, and status x day interaction on endometrial gene expression and NO content in uterine flushings. Endometrial iNOS gene expression did not change across days of the estrous cycle or early pregnancy ( $P=0.73$ ). However, a day x status interaction ( $P < 0.003$ ) was detected for endometrial eNOS gene expression, which increased 2 to 3 fold on days 10 and 12 in cyclic and pregnant animals. Gene expression continued to increase in cyclic animals until day 18 of the estrous cycle, whereas expression decreased slightly after day 12 of gestation. Similarly, a day x status interaction ( $P < 0.05$ ) was detected for total NO in uterine flushings. Total NO in the uterine flushings increased on day 12 in both cyclic and pregnant gilts. Uterine luminal NO declined on day 15, but a second increase in NO occurred in pregnant gilts on day 18. Detection of endometrial NOS gene expression and NO changes in uterine flushings, indicates a possible role of NO involvement during the establishment of

pregnancy and implantation in the pig. Supported by NRICGP/USDA No. 2002-35203-12262.

**Key Words:** Pig, Pregnancy, Uterus

**68 Improving the performance of weaned pigs with natural products.** J. W. Rounsavall<sup>\*1</sup>, C. A. Newman<sup>1</sup>, F. Neher<sup>2</sup>, and J. C. Laurenz<sup>1</sup>, <sup>1</sup>Texas A&M University-Kingsville, <sup>2</sup>Biomim, Inc., Herzogenburg, Austria.

This study investigated the effect of replacing antibiotic in the feed with a palatability enhancing product and acid (PEP 1000 and USACID, respectively; Biomim, Herzogenburg, Austria) on the performance of weaned pigs. Weaned, crossbred pigs ( $n=144$ ;  $6.7 \pm 0.3$  kg) were assigned by litter, gender and weight to one of two treatments. Pigs were fed standard nursery diets containing either 1% mecadox (Control; C) or PEP 1000 (2 %) and USACID (0.3%; Supplemented; S) over two 28-d nursery periods (NI = d 1 to 28 and NII = d 28 to 56 post-weaning). Daily feed amount and refusal was recorded throughout the experimental period and average daily feed intake (ADFI) was calculated. Pig weights were obtained at weekly intervals and ADG and gain:feed ratios calculated. Data were subjected to ANOVA for repeated measures and specific treatment comparisons made using Fisher's Protected Least Significant Difference. As expected, pigs gained weight ( $P < 0.01$ ) over the experimental period with pigs having similar weights ( $P > 0.10$ ) at the end of the NI and NII periods ( $14.8 \pm 0.6$  vs.  $14.4 \pm 0.5$  and  $30.5 \pm 1.0$  vs.  $30.4 \pm 0.8$  kg, for C vs. S, respectively). Supplementation increased ( $P < 0.05$ ) ADFI during both nursery periods ( $0.50 \pm 0.20$  vs.  $0.55 \pm 0.20$  and  $1.28 \pm 0.03$  vs.  $1.34 \pm 0.02$  Kg/d during NI and NII for C vs. S, respectively), and resulted in similar ( $P > 0.10$ ) levels of performance as measured by ADG ( $277 \pm 16$  vs.  $279 \pm 15$  and  $563 \pm 18$  vs.  $572 \pm 12$  g/d during NI and NII for C vs. S, respectively) and gain:feed ratios ( $0.59 \pm 0.09$  vs.  $0.54 \pm 0.03$  and  $0.45 \pm 0.02$  and  $0.45 \pm 0.02$  during NI and NII for C vs. S, respectively). Of particular importance, feeding PEP and USACID substantially reduced ( $P < 0.05$ ) mortality rate during the NI period ( $16.4$  vs.  $8.5\%$  for C vs. S, respectively), resulting in lowered production cost and increased net return per S fed compared to C fed pigs ( $5.80$  vs.  $2.94$ , respectively). These data suggest that feeding PEP and USACID during the post-weaning period may be an effective means of replacing the use of antibiotics and improving economic performance in commercial pig production.

**Key Words:** Pig, Antibiotic, Palatability

**69 The physical size of gestating sows.** J. J. McGlone<sup>1</sup>, B. Vines<sup>2</sup>, A. C. Rudine<sup>1</sup>, and P. Dubois<sup>2</sup>, <sup>1</sup>Pork Industry Institute, Department of Animal and Food Science, Texas Tech University, Lubbock, TX 79409-2141, <sup>2</sup>Cargill Pork, Inc., Russellville, AR 72811.

Two hundred and ninety-six gestating sows were used to determine the physical dimensions of sows in commercial settings. Sows were examined from 5 farms within a single production model that included identical feed formulation, management practices, herd health, and similar but not identical genotypes. Sows were individually weighed, backfat thickness determined by ultrasound and their body dimensions were determined. Sow body length, height, width and depth were determined in a single production model. Regression procedures were used to model the changes in sow body size in relation to parity, body weight and stage of gestation within and among genotypes. Farm-to-farm variation in sow dimensions for the same genotype was also determined. Least squares means, SD and 95% upper confidence limits of this sample are presented. Sow body weight increased ( $P < 0.001$ ) by predictable levels with parity, up to parity 6 and sow size increased by predictable levels with each day of pregnancy. Sows of different but related genotypes differed ( $P < 0.01$ ) in body length, width, height and depth. Sows of the same genotype, fed the same feed formulation, differed in body dimensions when managed on different farms. Models are presented to reflect the size of gestation crates needed to accommodate sow body dimensions given certain on-farm parity distributions. The data and models can be used to design crate sizes and farm floor space needs to meet current animal welfare recommendations. To accommodate the body size of pregnant sows on commercial farms, the crate sizes for the majority of sows would have to increase as would the total floor space needed for a given number of gestating sows individually penned in conventional production systems.

**Key Words:** Pig, Body Dimension, Welfare

**70 Libido after PGF<sub>2α</sub> treatment in boars with suppressed circulating concentrations of gonadal steroids.** M.J. Estienne<sup>\*1</sup>, A.F. Harper<sup>1</sup>, J.W. Knight<sup>1</sup>, C.R. Barb<sup>2</sup>, and G.B. Rampack<sup>3</sup>, <sup>1</sup>Virginia Polytechnic Institute and State University, Blacksburg, <sup>2</sup>USDA-ARS, Athens, GA, <sup>3</sup>University of Georgia, Athens.

Poor libido in boars has been associated with low circulating concentrations of gonadal steroids. We tested the hypothesis that PGF<sub>2α</sub> treatment increases libido in boars with suppressed testosterone and estradiol secretion. Prior to and during the experiment, semen was collected once weekly from terminal line boars (2.3 yr of age) trained to mount an artificial sow. After semen collection at wk 0, boars received an s.c. implant containing a potent GnRH agonist (GnRHa) (Deslorelin; Fort Dodge Animal Health, Fort Dodge, IA) or were sham-implanted. Beginning at wk 1, GnRHa-implanted boars received i.m. treatment with 10 mg PGF<sub>2α</sub> (Lutalyse; Pharmacia and Upjohn, Kalamazoo, MI) (n = 5) or vehicle (n = 5) upon entering the collection room. Sham-implanted boars (n = 5) received i.m. vehicle. Blood was sampled and libido assessed at wk 0 and 5. The GnRHa implants decreased serum concentrations of LH (by 60%; P = 0.05), testosterone (by 77%; P = 0.03) and estradiol (by 58%; P = 0.04). Hormone concentrations for sham-implanted boars were similar (P > 0.1) for wk 0 and 5. The number of boars ejaculating, time from entering collection room to the first attempt to mount, time from entering to the start of ejaculation, and duration of ejaculation were not affected by treatment (P > 0.1). Between wk 0 and 5, the number of false mounts (mounting artificial sow but dismounting prior to semen collection) increased (by 163%; P = 0.03) in GnRHa-implanted boars injected with vehicle, decreased (by 91%; P = 0.03) in GnRHa-implanted boars injected with PGF<sub>2α</sub>, and remained similar (P > 0.1) in sham-implanted boars. In summary, acutely suppressing concentrations of LH, testosterone and estradiol did not abolish libido in boars, but increased the number of false mounts of an artificial sow. The number of false mounts was decreased by PGF<sub>2α</sub> treatment.

**Key Words:** Boar, Libido, Prostaglandin

**71 Teaching hands on international agriculture with emphasis in Mexico.** J. A. Ortega-S<sup>1</sup>, J. A. Hinojosa<sup>2</sup>, and R. L. Stanko<sup>3</sup>, <sup>1</sup>Department of Animal and Wildlife Sciences, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, <sup>2</sup>College of Agricultural & Human Sciences, Texas A&M University-Kingsville, <sup>3</sup>Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville.

Northern Mexico and Texas have a long history of relationships and trading. Trained professionals that understand business practices in both countries are important for maintaining and improving economic relationships. Hispanic serving institutions play a major role in training professionals that can implement trans-cultural business relationships. However, animal, range, and wildlife science courses taught at these institutions often do not have an international component. The objective of this course is to provide the student with first hand exposure to Mexico's agricultural systems and culture. The course consists of three parts: 12 hr of classroom instruction; an 11-d tour of 4 Mexico states; and a written assignment developed by the student on a topic discussed during the tour. Students visit cattle, wildlife, and farming operations at subsistence and commercial levels, aquaculture operations, meat packing and food processing enterprises, experimental stations, and major agriculture universities in Northern Mexico. Cultural events are attended and interaction among students with Mexican students, professors, ranchers, and agricultural product merchandisers and managers is encouraged. These interactions give students the opportunity obtain first hand information about different aspects of Mexico culture and agriculture. Students are also exposed to a variety of Mexican foods, which vary drastically from region to region, to allow them to develop an understanding about differences among different Mexican regions as compared to the US. At the beginning of the course students are given a written exam to evaluate general knowledge about Mexico culture and agriculture. A written midterm and final exam are given to the students on d 6 and 11 of the tour to evaluate changes in the knowledge about Mexico. Mean initial, basic knowledge exam scores (65%) were lower (P < 0.05) than final, extensive knowledge exam scores (82%). Upon completion of the course students gain an understanding of Mexico culture and agriculture, and an appreciation for the complexity of the topic.

Ultimately, students should be able to develop ideas on potential agriculture programs or professional goals.

**Key Words:** International, Agriculture, Teaching

**72 Influence of postpartum nutrition of primiparous beef cows on Insulin-Like Growth Factor-I in follicular fluid and plasma.** I. Rubio<sup>\*</sup>, F. J. White, N. H. Ciccioli, R. P. Wettemann, and L. J. Spicer, Oklahoma Agricultural Experiment Station, Stillwater.

Effects of nutrition on insulin-like growth factor-I (IGF-I) and steroid hormones in dominant follicles (DF) and IGF-I in plasma were evaluated at 56 ± 9 d postpartum in anovulatory primiparous Angus x Hereford cows. Body condition score (BCS; 1 = emaciated, 9 = obese) at calving was 4.8 ± 0.2. Twenty-eight cows were blocked based on BCS and randomly assigned to one of two nutritional treatments at calving: moderate (M), 2.27 kg of 40 % CP per day and *ad libitum* hay; or high (H), *ad libitum* access to a 50 % concentrate diet and hay. Estrus was monitored with electronic mount detectors (HeatWatch) and blood samples were collected twice a week starting at 30 d postpartum. Ovarian follicles were evaluated daily by ultrasonography commencing at 35 d postpartum. When growth of DF plateaued, follicular fluid (FF) was obtained by transvaginal ultrasound-guided follicular aspiration. Body condition score at aspiration of the DF was greater (P < 0.01) for H (4.8 ± 0.2) than M (4.3 ± 0.3) cows. Maximum size of DF was not influenced by nutritional treatment (P > 0.10, 13.2 ± 1.6 mm). Concentrations of IGF-I in FF were greater (P < 0.01) for H (34.0 ± 10.7 ng/ml) than M (23.6 ± 8.5 ng/ml) cows, but concentrations of progesterone, androstenedione, and estradiol in FF were not influenced (P > 0.10) by treatment. Plasma concentrations of IGF-I prior to aspiration were greater (P < 0.01) in H (33.6 ± 11.7 ng/ml) than in M (18.6 ± 8.2 ng/ml) cows. Increased postpartum nutrient intake of primiparous beef cows increased BCS and increased concentrations of IGF-I in FF and plasma, at 56 d postpartum, without affecting size or steroidogenesis of DF.

**Key Words:** Nutrition Postpartum, Primiparous Cow, IGF-I

**73 Effects of body condition score at calving and length of the postpartum anovulatory interval on concentrations of steroids, insulin-like growth factor-I, and aromatase mRNA in dominant follicles.** F. J. White<sup>\*</sup>, I. Rubio, D. W. Kastner, R. P. Wettemann, and L. J. Spicer, Oklahoma Agricultural Experiment Station, Stillwater.

Effects of body condition score (BCS) at calving and length of the postpartum anovulatory interval (PPI) on IGF-I, steroids, and aromatase mRNA in dominant follicles (DF) were evaluated in Angus x Hereford cows (n = 22). Growth of follicles were monitored by daily ultrasonography commencing 15 d postpartum and continuing until DF was 2 mm larger than the subordinate follicle and at least 10 mm in diameter. Within 24 h (22 ± 0.7 d after calving), the DF was removed by transvaginal ultrasound-guided follicular aspiration, and follicular fluid (FF) and granulosa cells were collected from cows with either a high (≥ 5.5) or low (≤ 4.5) BCS at calving. Cows were also classified as having a PPI > 58 d or < 58 d. In addition, FF was collected from the first wave DF of cycling cows. Cows with a PPI > 58 d averaged 82 ± 12 d until the first ovulation and cows with a PPI < 58 d averaged 49 ± 6 d (P < 0.01). Cows calving with high and low BCS had PPI of 60 ± 9 d and 72 ± 11 d, respectively (P > 0.1); BCS at calving and length of the PPI did not influence size of anovulatory DF, concentrations of estradiol, androstenedione, progesterone, and IGF-I in FF, or the amount of aromatase mRNA in granulosa cells at 22 d postpartum. At 22 d postpartum, cows with a PPI > 58 d tended (P < 0.1) to have lower concentrations of progesterone in FF than cyclic cows and cows with a PPI < 58 d. At 22 d postpartum, DF of anestrus cows were 1 ± 0.3 mm smaller (P < 0.05) and had lower concentrations of estradiol (P < 0.001) and androstenedione (P < 0.05) than DF of the first wave of an estrus cycle. Anestrus and cyclic cows had similar concentrations of IGF-I in FF and aromatase mRNA in granulosa cells. In conclusion, inadequate concentrations of androstenedione may limit estradiol synthesis by DF of postpartum anestrus cows.

**Key Words:** Beef Cow, IGF-I, Body Condition Score

**74 Free IGF-I in follicular fluid: Relationship with total IGF-I, IGFBP, and steroids in dominant and large subordinate follicles of preovulatory cattle.** C. A. T. Santiago\*, J. L. Voge, P. Y. Aad, D. T. Allen, D. R. Stein, J. R. Malayer, and L. J. Spicer, *Oklahoma State University*.

The objective of this study was to evaluate if changes in follicular fluid (FFL) IGFBP and steroid levels are associated with changes in free IGF-I in dominant and large subordinate follicles of preovulatory cattle. Estrous cycles of non-lactating dairy cows (n = 15) were synchronized with two injections of PGF2 $\alpha$  11 d apart. Follicular growth was monitored daily via transrectal ultrasonography 5 d before the second injection of PGF2 $\alpha$ . FFL from the dominant and largest subordinate follicles was collected via transvaginal aspiration at 24 or 48 h post PGF2 $\alpha$ . FFL concentrations of various IGFBP, free and total IGF-I, and steroids were determined using one-dimensional SDS-PAGE, free IGF-I immunoradiometric assay and RIA, respectively. Data were analyzed using the MIXED procedure of SAS and differences in treatment means were evaluated using LSMEANS with the PDIF option. Pearson correlation coefficients were also calculated. FFL free IGF-I concentrations were 9-fold greater (P < 0.0001) in dominant (18.6 ng/mL) than in the large subordinate (2.2 ng/mL) follicles, and did not change between 24 and 48 h. Total IGF-I concentrations did not differ (P > 0.10) among follicle types or correlate with free IGF-I. The calculated percentage of free IGF-I was greater (P < 0.001) in dominant (22.2%) than in subordinate (4%) follicles. Levels of IGFBP-2, -4, and 5 were significantly greater (P < 0.005) in large subordinate than in dominant follicles. Free IGF-I was not significantly correlated with IGFBP-3 but was negatively correlated (P < 0.01) with IGFBP-2 (r = -0.53), -4 (r = -0.51) and -5 (r = -0.52), and positively correlated with estradiol (r = 0.73) and androstenedione (r = 0.56) levels. We conclude that greater intrafollicular free IGF-I concentrations (because of decreased levels of low molecular weight IGFBP) may enhance steroidogenesis in preovulatory dominant follicles of cattle.

**Key Words:** Insulin-like Growth Factor, Follicular Fluid, Ovarian Follicles

**75 Reproductive performance of yearling heifers fed Megalac<sup>®</sup> before breeding.** N. M. Long\*<sup>1</sup>, G. M. Hill<sup>1</sup>, J. F. Baker<sup>1</sup>, W. F. Graves<sup>2</sup>, M. A. Froetschel<sup>2</sup>, and B. G. Mullinix, Jr.<sup>1</sup>, <sup>1</sup>University of Georgia, Tifton, GA/USA, <sup>2</sup>University of Georgia, Athens, GA/USA.

Effects of energy supplementation before breeding on beef heifer (initial BW 376.9  $\pm$  29.9 kg; age 14 to 15 mo) reproductive performance was determined. Angus (A) and Polled Hereford (PH) heifers grazed sod-seeded ryegrass pastures, and were randomly assigned to Control (C; no supplementation, n = 20) or Megalac<sup>®</sup> (M; n=21; mixture of 8% Megalac, 92% corn gluten feed fed 5 d/wk at 3.45 kg/d) during the pre-breeding interval from February 11 (Feb 11) to April 11(Apr 11). During the 71-d breeding period beginning April 14, estrual activity was monitored visually and by the Heatwatch<sup>®</sup> system. Heifers were bred using AI during the first 44 d, and with fertile bulls during the remaining 27 d. Least squares means for heifer BW (kg), and ultrasound rib fat (US; cm), for C and M, respectively, were: February 11 = 376, 373, 2.23, 2.15, SE 6.4, 0.11; and February 11 BW was a covariate in analyses for April 11 = 431, 434, 2.20, 2.36, SE 6.4, 0.11, and June 18 = 444, 446, 2.09, 2.22, SE 3.1, 0.11. Treatment (T) did not affect (P > 0.10) heifer BW or US on April 11 or June 18. Cholesterol and high-density lipids (CHO; HDL; mg/dl) increased (P < 0.01) in M heifers during treatment (Table 1). Serum low-density lipids (LDL) and triglyceride (TRI) were unaffected (P > 0.10) by T or sampling date. Megalac treatment increased (P < 0.01) the percentage heifers with ovarian luteal activity (OLA; %), and enhanced (P < 0.12) pregnancy rate (PREG; %). Breed (B) affected pregnancy rate (P < 0.05), with higher values for A than PH heifers. Feeding M pre-breeding increased serum CHO, HDL, and ovarian luteal activity, and tended to increase pregnancy rate (P < 0.12).

Item	Control		Megalac		Effect		
	A (n=12)	PH (n=8)	A (n=12)	PH (n=9)	SE	T	B
CHO (Feb 11)	124.8	117.8	112.4	135.2	5.8		*
CHO (Apr 11)	141.8	137.4	153.6	172.2	5.3	**	
HDL (Feb 11)	96.4	93.2	85.9	108.4	3.4		*
HDL (Apr 11)	101.2	100.6	113.9	130.5	4.3	**	
OLA (Apr 11)	33.3	25.0	58.3	66.7	11.1	*	
PREG (Sep 17)	77.4	35.0	92.9	64.0	10.3		*

**Key Words:** Heifer Reproduction, Megalac, Cholesterol

**76 Influence of time of insemination after the onset of estrus on pregnancy rate of beef heifers.** R. P. Wettemann\*, F. J. White, I. Rubio, D. W. Kastner, and D. L. Lalman, *Oklahoma Agricultural Experiment Station, Stillwater*.

Time of ovulation of beef cows relative to the onset of estrus averages 31 $\pm$ 1 h (range 22 to 43 h; J. Anim. Sci. 2002. 80:3053). With precise detection of onset of estrus, the optimal time for insemination (AI) should be determined. A radiotelemetric system was used to detect when a cow was mounted, and the onset of estrus in Angus x Hereford beef heifers (n=161) during three years. Onset of estrus was defined as the first of two mounts received within 4 h. Estrus was induced by treatment with PGF2 $\alpha$  (Lutalyse, 25 mg; Pharmacia Animal Health, Kalamazoo MI), and heifers that did not respond were given a second treatment 7 d later. Heifers were randomly allotted for AI by one technician at 1 to 4, 16 to 20 or 32 to 36 h after the onset of estrus, and six sires were blocked across treatments. Pregnancy rate was determined 26 to 32 d after AI by ultrasonography and calves born to AI was determined. Pregnancy rate was not influenced by time of AI relative to the onset of estrus and averaged 62.3, 70.2, and 63.4 % for AI at 1 to 4, 16 to 20 and 32 to 36 h, respectively. Time of AI did not influence the percentage of live fetuses at 26 to 32 d of gestation that resulted in normal live births and 95.6 % of early pregnancies resulted in the birth of calves. Insemination of heifers in this study at 1 to 4 and 32 to 36 h after the onset of estrus resulted in pregnancy rates similar to heifers inseminated at 16 to 20 h after the onset. Because of the limited number of heifers in each treatment (n=49 to 57), additional observations may be necessary to conclusively determine if AI of beef heifers at 16 to 20 h after the onset of estrus (11 to 15 h before the expected time of ovulation) will increase pregnancy rate compared with AI at 1 to 4 and 32 to 36 h after the onset of estrus.

**Key Words:** Estrus, Beef Heifers, Insemination

**77 Pregnancy rate and gestation length of early and late fall calving beef cows.** D. W. Kastner\*, I. Rubio, F. J. White, and R. P. Wettemann, *Oklahoma Agricultural Experiment Station*.

Fifty Angus x Hereford cows were blocked (year 1) by prior calving date and randomly assigned to early (E, August) and late (L, October) fall calving groups. The E and L groups were artificially inseminated (AI) in early November or early January, respectively, with semen from the same sire. All cows were exposed to a bull at 4 d after AI for 35 d. Both groups grazed prairie grass pastures with natural shade. Supplemental protein was fed to maintain a body condition score (BCS; 1 = emaciated, 9 = obese)  $\geq$  5 through AI. The E cows had a shorter (P < 0.09) gestation than L cows (E = 280.1  $\pm$  1.2, L = 283.0  $\pm$  1.1). Maximum daily temperature during the week prior to calving averaged 34  $\pm$  3 $^\circ$  and 19  $\pm$  3 $^\circ$  C for E and L cows, respectively, with 100% survival of calves in both seasons. Ovulation synchronization (year 2) was accomplished by administering 100  $\mu$ g GnRH (Cystorelin, Merial) and an intravaginal progesterone releasing insert (CIDR; Pharmacia Animal Health) on d 0, 25 mg PGF2 $\alpha$  (Lutalyse, Pharmacia Animal Health) and CIDR removal on d 7, and 100  $\mu$ g GnRH and AI on d 9. All E and L cows had luteal activity (progesterone  $\geq$  0.5 ng/ml) prior to ovulation synchronization. BCS was similar (P > 0.10) for E and L cows at breeding (E = 5.2  $\pm$  0.1, L = 5.5  $\pm$  0.1) and at the end of winter supplementation (E = 4.5

$\pm 0.1$ ,  $L = 4.8 \pm 0.1$ ). Pregnancy rates were similar ( $P > 0.10$ ) for the E (93.1%) and L (96.0%) cows. With adequate shade and proper management, calf survival is good in August and October. Maintenance of  $BCS \geq 5$  until AI in early November or early January resulted in all cows with luteal activity and excellent pregnancy rates. Additional observations are necessary to evaluate the effects of ambient temperature on gestation length.

**Key Words:** Fall Calving, Artificial Insemination, Gestation Length

**78 Influence of progesterone on estrous characteristics and pregnancy rate of grazing beef cows.** R. Flores<sup>\*1</sup>, M. L. Looper<sup>2</sup>, D. L. Kreider<sup>1</sup>, and C. F. Rosenkrans, Jr.<sup>1</sup>, <sup>1</sup>University of Arkansas, Fayetteville, <sup>2</sup>USDA-ARS, Dale Bumpers Small Farms Research Center, Booneville, AR.

Eighty-four multiparous, cross-bred cattle (1/4 to 3/8 Brahman) were utilized to evaluate the effects of progesterone on estrous characteristics and pregnancy rates. Prior to the breeding season, 3 wk blood samples were collected and progesterone ( $P_4$ ) was quantified to determine luteal activity. Luteal activity was defined as concentrations of  $P_4 \geq 1$  ng/mL in two consecutive samples. Cows grazed common bermudagrass [*Cynodon dactylon* (L.) Pers] paddocks throughout the breeding season, and cows received  $P_4$  via an intravaginal insert (CIDR) or no  $P_4$  on Day 1 of the breeding season. On Day 7, CIDRs were removed and cows receiving CIDRs were administered prostaglandin  $F_{2\alpha}$  ( $PGF_{2\alpha}$ ). All cows were exposed to bulls and fitted with a HeatWatch transmitter to record estrous activity during the first 30 d of the breeding season. At initiation of the breeding season, body weight and body condition score averaged  $557 \pm 65$  kg and  $6.3 \pm 0.8$ , respectively, for all cows. Thirty-seven percent of cows were anestrous at start of the breeding season. Duration of estrus and quiescence between mounts were similar ( $P > 0.10$ ) between cows with and without a CIDR. Mean duration of estrus and quiescence between mounts averaged  $7.3 \pm 0.8$  h and  $2.3 \pm 0.3$  h, respectively. However, cows with a CIDR had an increased ( $P < 0.05$ ) number of mounts ( $25.4 \pm 2.3$ ) compared with cows without a CIDR ( $17.0 \pm 2.9$ ). Sixty-seven percent of cows administered a CIDR and  $PGF_{2\alpha}$  exhibited estrus within 72 h after CIDR removal. More anestrous cows administered a CIDR for 7 d tended ( $P = 0.12$ ) to exhibit estrus during the first 30 d of the breeding season than anestrous cows without a CIDR. Pregnancy rates were similar between CIDR treatments. Exposure to  $P_4$  for 7 d via a CIDR increased the number of mounts during estrus and tended to initiate estrus in anestrous Brahman-influenced cows.

**Key Words:** Beef Cows, Progesterone, Estrus

**79 CIDR and MGA synchronization protocols with timed insemination in beef heifers.** N. M. Post<sup>\*</sup>, D. L. Kreider, and R. W. Rorie, University of Arkansas.

An experiment was conducted to compare two progestin based estrus synchronization programs for fixed-time AI in beef heifers. Angus-cross heifers ( $n = 34$ ) approximately 14.5 months of age at breeding were sorted by body condition score (BCS), and BW; then randomly assigned to one of two treatments. Treatments were: MPPG ( $n = 17$ ): MGA (.5mg/hd/d) for 14 d followed by 25mg Lutalyse (PG) 17 d after MGA withdrawal and GnRH (100  $\mu$ g Fertagyl) 48 h after PG; and CIDR ( $n = 17$ ): 100  $\mu$ g GnRH plus Eazi-Breed CIDR for 7 d then PG followed in 48 h by GnRH. All heifers were inseminated 18 h after GnRH. Bulls were placed with heifers 10 d after AI. Conception rate (CR) was determined by ultrasound 40 d post AI and pregnancy rate (PR) was determined by rectal palpation 55 d after bull removal. Serum was collected and analyzed for progesterone ( $P_4$ ) on d 6, 1 and 31 of MGA treatment for MPPG and on d 6, 1 and 7 for CIDR. Heifers were assumed to be cycling before treatment if  $P_4$  was  $\geq 1$  ng/ml on d 6 or 1 and were considered to have a functional CL if  $P_4$  was  $\geq 1$  ng/ml on d 31 (MPPG) or d 7 (CIDR). Age at the time of AI did not differ between MPPG and CIDR (437 vs. 433  $\pm 3$  d, respectively). Both MPPG and CIDR treatments had CR of 59%, and PR was 76% for both groups. A larger number of heifers were cycling at the beginning of treatment in the CIDR group compared to the MPPG group (47% vs. 29%,  $P = .28$ ), and more MPPG heifers had a functional CL at the time of PG injection than CIDR heifers, (76% vs. 53%,  $P = 0.15$ ). For cycling heifers, CR was 80% for MPPG versus 63% for CIDR ( $P = 0.5$ ). For heifers with a

functional CL PR was 77% and 56%, for MPPG and CIDR respectively ( $P = .29$ ). In non-cycling heifers CR and PR was 50% vs. 56% ( $P = 0.8$ ) and 75% vs. 78% ( $p = 0.88$ ) for MPPG and CIDR respectively. This study indicates that conception rate to AI and overall pregnancy rates are similar in beef heifers exposed to either a CIDR Cosynch or a MGA-PG-GnRH protocol followed by timed AI.

**Key Words:** Estrus Synchronization, Timed AI, Beef Heifers

**80 Invited Paper: Breeding dairy cattle during summer heat stress: Current strategies, pros and cons.** S. T. Willard<sup>\*</sup>, Mississippi State University, Starkville.

Abstract not available.

**81 Vaginal and skin temperatures of Holstein cows under conditions of heat stress in the tropics.** R. W. Godfrey<sup>\*</sup>, R. E. Dodson, and A. J. Weis, University of the Virgin Islands, Agricultural Experiment Station.

This study was conducted to evaluate the impact of the tropical environment on body temperatures of Holstein cows. Eight dark (> 50 % black hair) and four light (< 50% black hair) pregnant, dry cows ( $n = 12$ ) were evaluated for 48 hr while grazing native pasture. Vaginal temperatures were recorded using a wireless data logger. Subcutaneous temperatures were collected under white or black hair using two leads of a 4-channel data logger held on the cow using nylon straps (6 cm wide) and athletic tape. A HOBO data logger measured environmental temperature and relative humidity which were used to calculate temperature-humidity index (THI). All data loggers (Onset Corp.) were programmed to record at 5-min intervals. Data were analyzed using GLM and correlation procedures of SAS. Mean, minimum and maximum THI was 80.1, 75.0 and 85.9, respectively. There was no difference ( $P > 0.10$ ) in temperature under white or black hair ( $37.9 \pm 0.04$  vs  $37.8 \pm 0.04$  deg #C, respectively). There was no difference ( $P > 0.10$ ) in temperature under white hair between dark and light cows ( $37.9 \pm 0.01$  vs  $37.9 \pm 0.03$  deg #C, respectively). There was no difference ( $P > 0.10$ ) in temperature under black hair between dark and light cows ( $37.9 \pm 0.05$  vs  $37.7 \pm 0.01$  deg #C, respectively). Vaginal temperature was not different between dark and light cows ( $38.9 \pm 0.01$  vs  $38.8 \pm 0.01$  deg #C, respectively). Peak skin and vaginal temperatures lagged behind peak environmental temperature by 157 and 278 min, respectively. Temperature under white or black hair and vaginal temperature were correlated with environmental temperature ( $P < 0.0001$ ;  $r = 0.38, 0.38$  and  $0.21$  respectively). Range in temperature was smallest ( $P < 0.0001$ ) in the vagina and greater under the white and black hair ( $1.2 \pm 0.15, 2.1 \pm 0.21, 2.7 \pm 0.21$  deg #C, respectively). Dark cows tended to have higher ( $P < 0.07$ ) maximum skin and vaginal temperatures than did light cows. Coat color did not appear to have a strong influence on the response of dairy cows to elevated environmental temperatures as measured by either subcutaneous or vaginal temperatures.

**Key Words:** Dairy Cattle, Heat Stress, Temperature

**82 Production and physiological differences between large and small Holstein cows cooled with fans or fans and sprinklers.** S. Bowers<sup>\*1</sup>, S. Gandy<sup>1</sup>, T. Adams<sup>2</sup>, J. Murphey<sup>2</sup>, and S. Willard<sup>1</sup>, <sup>1</sup>Mississippi State University, <sup>2</sup>Coastal Plain Experiment Station.

Fans and fans plus sprinklers have been shown to alleviate heat stress in dairy cows during the summer. The objective of this study was to investigate the use of each of these methods of cooling in relation to the physiological responses as associated with cow body size. Lactating Holstein cows ( $n=72$ ;  $203.9 \pm 7.0$  days in milk;  $34.1 \pm 0.8$  kg milk production) were assigned to one of two cooling groups (fan or fan and sprinkler) relative to body size (large and small). Body size was determined based on measurements for BW ( $709.7 \pm 8.3$  vs  $608.5 \pm 5.4$  kg;  $P < 0.001$ ), hip height ( $140.6 \pm 0.5$  vs  $136.7 \pm 0.5$  cm;  $P < 0.001$ ), body length ( $159.9 \pm 0.9$  vs  $152.1 \pm 0.9$  cm;  $P < 0.001$ ) and heart girth ( $208.0 \pm 0.9$  vs  $195.3 \pm 0.7$  cm;  $P < 0.001$ ) for large and small cows, respectively. Milk production and temperature humidity index (THI) were recorded daily. Rectal temperatures (RT), respiration rates per minute (RPM), and hair coat infrared measurements (dorsal, DIR; ventral, VIR) were recorded at 14d intervals from d0 to d98 during the summer. Cows were housed in a free stall barn and cooled by fans that operated when the

air temperature was above 23.9°C, while fan and sprinkler groups were cooled using sprinklers with a 5 min on / 10 min off cycle during the day. Average THI for the trial period was 74.7 ± 0.2 with peak THI reaching 89.5. Rectal temperatures, DIR, VIR and RPM did not differ (P>0.10) in relation to cow size. However, the cows in the fan and sprinkler groups had lower (P<0.01) RT (39.0 ± 0.0 vs 39.5 ± 0.1°C), DIR (34.9 ± 0.1 vs 35.9 ± 0.1°C), VIR (34.2 ± 0.1 vs 35.5 ± 0.1°C), and RPM (80.7 ± 1.5 vs 90.5 ± 1.4) than cows in the fan only groups, respectively. Milk production did not differ (P>0.10) relative to cow size, however cows cooled with fans and sprinklers tended (P<0.07) to produce more milk daily throughout the trial (27.6 ± 0.7 kg) than the fan only group (25.9 ± 0.7 kg). In conclusion, there were no differences in relation to cow body size within cooling groups. However, the cows in the fan and sprinkler group were cooler and tended to produce more milk than the cows in the fan only group.

**Key Words:** Heat Stress, Holstein Cows, Milk Production

**83 The effects of brown mid-rib (BMR) corn silage and tunnel ventilation cooling on symptoms of heat stress in lactating dairy cows.** R. J. Williams<sup>\*1</sup>, A. M. Chapa<sup>1</sup>, T. O. Riley<sup>2</sup>, D. O. Pouge<sup>2</sup>, S. T. Willard<sup>1</sup>, and T. R. Smith<sup>1</sup>, <sup>1</sup>Department of Animal and Dairy Sciences, Mississippi State University, <sup>2</sup>North Mississippi Branch Experiment Station, Holly Springs, MS.

The potentials for tunnel ventilation cooling and brown mid-rib corn silage to alleviate heat stress were studied in four groups of 10 mid-lactation Holstein cows. Two groups were housed inside a tunnel ventilation barn while the remaining groups were housed in an adjacent outside freestall barn and cooled with fans and sprinklers. One group in each barn received a diet based on BMR corn silage while the remaining group was fed a diet based on a normal corn silage variety. Diets were balanced for protein and fiber contents, however; neutral detergent fiber digestibility was 55.3% in BMR silage versus 44.5% in the normal silage. Dry matter intake averaged 21.4 kg/hd/day and did not differ between the dietary treatments. Milk fat percentage averaged 0.20 units lower (P<0.0008) in BMR fed cows than controls but there were no differences in milk production. The tunnel ventilation barn averaged 6degC less and the average exposure time to moderate heat stress (temperature-humidity index of 80-90) was reduced 6.75 h/day compared to cows housed outside. For cows housed in the tunnel barn, maximum daytime rectal temperatures averaged 0.28degC (P<0.0001) less and maximum daytime respiration rates averaged 15.0 breaths/min (P<0.0001) less than for cows housed outside. There were no significant differences in milk production, milk composition or the incidence of mastitis between housing assignments. Thus, under these conditions, tunnel ventilation cooling was comparable to traditional cooling methods for reducing the severity of heat stress in dairy cows in the southeastern U.S. BMR corn was helpful in maintaining production in heat stressed cows, however; the BMR diet studied did not significantly reduce symptoms of heat stress.

**Key Words:** Dairy Cow, Heat Stress, Brown Mid-rib Corn

**84 Relationship between animal temperament and stress physiology in Brahman cows.** K. O. Curley, Jr.<sup>\*1</sup>, D. A. Neuendorff<sup>2</sup>, A. W. Lewis<sup>2</sup>, J. J. Cleere<sup>2</sup>, T. H. Welsh, Jr.<sup>1</sup>, and R. D. Randel<sup>2</sup>, <sup>1</sup>Texas Agricultural Experiment Station, College Station, <sup>2</sup>Texas Agricultural Experiment Station, Overton.

Animal temperament has been inversely associated with carcass quality and feedlot performance traits. The physiological mechanisms associated with temperament have yet to be specifically identified. Clarification of such mechanisms could lead to an understanding of the biological basis behind performance declines associated with poor temperament. The objective of this study was to compare, across differing degrees of animal temperament, serum concentrations of cortisol (CS) before and after administration of exogenous ACTH. A group of ~21d postpartum Brahman cows (n = 91; 3-to-13 yr of age) was utilized. Blood was sampled via coccygeal venipuncture prior to, and 30 min after administering ACTH (0.1 IU/kg BW). CS concentrations (ng/ml) were determined via RIA. Parameters of initial CS (ICS) and CS response (RCS) were utilized. Measures of individual temperament included: a temperament rating (T), identified as (1 = calm, 2 = normal, and 3 = wild); chute scores (CH), determined from behavioral responses to restraint on the scale (1 = quiet to 5 = wild); and exit velocity (EV), a measure of the

rate (m/sec) at which animals exited the chute and traversed a fixed distance (1.83 m). Animals were grouped by age (AG) into (1 = 3 yr, 2 = 4 ≥ 8 yr, and 3 = > 8 yr). Pearson correlation coefficients (r) and ANOVA were utilized for statistical comparisons. T influenced (P < 0.01) ICS (1 = 10.71±1.56, 2 = 12.84±1.12, and 3 = 21.53±1.56). In addition, ICS was correlated (P < 0.01) with all measures of temperament: for T r = 0.45, for EV r = 0.28, and for CH r = 0.34. AG was correlated (P < 0.05) with all measures of temperament, for T r = -0.21, for EV r = -0.23, and for CH r = -0.31, as well as ICS r = -0.30 (P < 0.01). RCS was correlated (P < 0.01) with ICS r = -0.31 and with CH r = -0.25 but not T, EV, or AG. A link between temperament and stress biology may be supported as animals with more excitable temperaments had increased CS concentrations and a suppressed response to adrenal stimulation.

**Key Words:** Temperament, Exit Velocity, Cortisol

**85 Profiling mastitis in dairy cows: A case study of natural infection and thermal responsiveness.** S. Schmidt<sup>\*1</sup>, P. Hillman<sup>2</sup>, C. Lee<sup>3</sup>, K. Graves<sup>1</sup>, D. Hostetler<sup>1</sup>, and S. Willard<sup>1</sup>, <sup>1</sup>Mississippi State University, <sup>2</sup>Cornell University, <sup>3</sup>University of Hawaii.

Lactating Holstein cows outfitted with internal body temperature (BT) loggers as part of an environmental management study developed mastitis due to a change in milking procedures. This provided an opportunity to profile three clinical case studies of natural infection as compared to case controls (n = 17) to assess the spatial relationship between the initiation of mastitis and thermal responses pre-and post-infection as correlated with milk production and milk quality parameters. Cow A was infected in the right-rear quarter (*Klebsiella pneumoniae*), B in the left-rear quarter (*Streptococcus dysgalactiae*) and C in the fore-left quarter (*K. pneumoniae*). Milk production records were obtained daily for 10 d pre-infection through 6 d post-infection. Milk samples, collected weekly for 3 wk pre-infection and for 2 wk post-infection, were utilized to evaluate milk quality (fat, protein, lactose, and somatic cell count (SCC)), and for identification of causative pathogens. Intra-vaginal temperature loggers were used to collect BT at 5-min intervals and were quantified for 10 d prior to infection through 6 d post-infection. Digital infrared thermal imaging (DITI) of infected and uninfected quarters were performed for 6 d post-infection. With the presence of causative organisms there was an increase in SCC (Cow A: 4.17, B: 7.05, and C: 1.50 x 10<sup>6</sup>), while other milk quality parameters did not differ pre-, during or post-infection. Milk production decreased (Cow A: 16.17%, B: 70.21%, and C: 52.17%) during infection, but returned to normal levels within 7.7 ± 0.9 days. No differences were observed in thermal gradients of the udder due to infection as determined by DITI. For the 3 cows profiled BT was 38.7 ± 0.01degC pre-infection and rose to 41.4 ± 0.3degC at inception of infection, while BT of case controls remained at 38.6 ± 0.004degC. Elevations in BT (> 1 SD of the mean) of infected cows persisted for only 3.7, 8.3 and 9.4 h for Cow A, C and B, respectively. In summary, intra-vaginal temperature loggers provided a spatially resolved profile of BT changes in response to these cases of clinical mastitis. These case studies demonstrate that the dramatic rise in BT is short-lived but may be detected with the aid of intra-vaginal temperature loggers.

**Key Words:** Mastitis, Body Temperature, Dairy Cows

**86 Breedtype influences hypothalamic-pituitary-adrenal axis activity and responsiveness to exogenous bovine corticotropin-releasing hormone (bCRH) in beef steers.** L. E. Jonovich<sup>\*1</sup>, R. J. Hollenbeck<sup>1</sup>, K. O. Curley, Jr.<sup>1</sup>, R. D. Randel<sup>2</sup>, and T. H. Welsh, Jr.<sup>1</sup>, <sup>1</sup>Texas Agricultural Experiment Station, College Station, <sup>2</sup>Texas Agricultural Experiment Station, Overton.

Pituitary and adrenal responsiveness to exogenous bovine CRH was studied using Angus, Brahman, Bonsmara and Bonsmara X Angus steers (BW=332 ± 39 kg; n = 8 for each breedtype). Blood samples were collected via indwelling jugular cannula at 120, 90, 60, and 30 min prior to, and at 10, 20, 30, 60, and 120 min after CRH administration (Time 0; 0.1 ug/kg BW). Plasma concentration of adrenocorticotropin (ACTH) and cortisol (CS) were determined by RIAs. During the 120-min period prior to CRH administration, plasma concentration of ACTH averaged 44.8 ± 3.7 pg/ml in the Brahman steers, which was similar to that of the Angus steers (38.8 ± 3.7 pg/ml). Additionally, average plasma ACTH concentration was higher (P < 0.05) in the Brahman than in the Bonsmara X Angus (32.1 ± 3.7 pg/ml) and Bonsmara (23.4 ± 3.7 pg/ml)

steers. Likewise, the average plasma concentration of CS was similar in Brahman ( $19.3 \pm 2.1$  ng/ml) and Angus ( $14.2 \pm 2.1$  ng/ml) steers. The average plasma CS concentration in Brahman was also higher ( $P < 0.05$ ) than in Bonsmara X Angus ( $11.3 \pm 2.1$  ng/ml) and Bonsmara ( $6.9 \pm 2.1$  ng/ml) steers. At Time 0 plasma ACTH and CS did not differ ( $P > 0.10$ ) among breedtypes. Amplitude of ACTH and CS responses to bCRH did not differ ( $P > 0.10$ ) among the breedtypes, nor did peak ACTH concentrations ( $P > 0.10$ ). However, peak CS concentration was greater in Angus and Brahman than Bonsmara or Bonsmara X Angus ( $P < 0.05$ ) steers. Over all the steers, the amplitude of ACTH response was moderately correlated with the amplitude of the CS response ( $r = 0.43$ ,  $P < 0.01$ ). This correlation varied among the breedtypes (Angus:  $r = 0.58$ ,  $P = 0.13$ ; Brahman:  $r = 0.59$ ,  $P = 0.11$ ; Bonsmara X Angus:  $r = 0.37$ ,  $P = 0.36$ ; Bonsmara:  $r = 0.08$ ,  $P = 0.85$ ). It was determined that breedtype did not influence pituitary ACTH release caused by exogenous CRH, but it did influence the adrenal CS release. Also, the consistently lower concentrations of ACTH and CS in the Bonsmara cattle suggest that this breedtype has a less active Hypothalamic-Pituitary-Adrenal axis.

**Key Words:** ACTH, Cortisol, Corticotropin-releasing Hormone

**87 Discrimination between two levels of indigenous external parasite burden in free-ranging beef cattle via near infrared reflectance spectroscopy of feces.** P. D. Teel<sup>\*1</sup>, O. F. Strey<sup>1</sup>, R. E. Wright<sup>2</sup>, L. A. Coburn<sup>2</sup>, D. R. Tolleson<sup>1</sup>, and J. W. Stuth<sup>1</sup>, <sup>1</sup>Texas Agricultural Experiment Station, College Station, <sup>2</sup>Oklahoma Agricultural Experiment Station, Stillwater.

Previous studies have reported differences in fecal near infrared (NIR) spectra of livestock experiencing a pre-determined tick burden but no such observations have been made for free-ranging animals. This study seeks to determine the ability of fecal near infrared reflectance spectroscopy (NIRS) to discriminate between cattle experiencing divergent external parasite burdens. Twenty mature crossbred cows ( $500 \pm 25$  kg) grazing tall-grass prairie were randomly assigned to an acaricide treatment (TRT) or control (CON) group. Fecal samples and manual parasite counts were obtained wk<sup>-1</sup> from April 4 (W1) until May 9 (W6), 2003. Tick species included: Gulf Coast (*Amblyomma maculatum*), Lone Star (*A. americanum*), black-legged (*Ixodes scapularis*), and winter (*D. albipictus*) ticks. Treatment was administered after sampling on W1 and W5. Differences in tick numbers between weeks and treatments were determined by general linear model procedures. Differences in fecal NIR spectra (1108 to 2492 nm) between groups were determined by a 2-block multiple partial least squares procedure. Differences in proportion of correct vs. incorrect group membership identification was determined by  $\chi^2$ . Total tick numbers were:  $26.1 \pm 1.7$  vs.  $31.1 \pm 2.9$ ,  $1.6 \pm 0.4$  vs.  $21.2 \pm 2.4$ ,  $0.4 \pm 0.2$  vs.  $18.8 \pm 2.4$ ,  $4.3 \pm 0.9$  vs.  $31.7 \pm 7.0$ ,  $14.2 \pm 2.4$  vs.  $38.3 \pm 5.4$ ,  $24.6 \pm 2.9$  vs.  $41.3 \pm 5.1$  for TRT vs. CON, W1 to W6, respectively. Tick numbers were affected ( $P < 0.01$ ) by week, treatment, and the interaction.  $R^2$  and SE of cross validation (SECV) for NIRS discriminant equations were: 0.24, 0.56 (W1), 0.98, 0.36 (W2), 0.67, 0.68 (W3), 0.55, 0.47 (W4), 0.17, 0.45 (W5), and 0.62, 0.49 (W6). Samples from W2, W3, and W4 were combined within treatment group. The resulting NIRS discriminant equation ( $R^2 = 0.80$ ,  $SECV = 0.52$ ) correctly identified 8/10 TRT and 6/10 CON samples not used in the calibration. Performance of the NIRS discriminant equation indicates potential for detecting external parasite burdens in free-ranging animals with temporal and spatial expansion of the calibration data.

**Key Words:** External Parasite, Feces, Near Infrared Reflectance Spectroscopy

**88 Effects of a Lone Star tick (*Amblyomma americanum*) burden on growing beef steers: Intake, weight gain, and metabolic indicators.** D. R. Tolleson<sup>\*</sup>, J. W. Stuth, P. D. Teel, O. F. Strey, T. M. Bryan, K. A. Dean, G. E. Carstens, and T. H. Welsh Jr., Texas Agricultural Experiment Station, College Station.

An experiment using 20 Angus crossbred, 9-month-old steers ( $254 \pm 6.1$  kg) examined the effects of a Lone Star tick burden on DMI, ADG, serum IGF-1 and cortisol (CS), plasma glucose (GLU) and lactate (LCT) concentrations. Steers were randomly assigned to one of three groups: A) non-treated, *ad libitum*-fed, B) tick treated, *ad libitum*-fed, and C) non-treated, pair-fed, i.e. offered DMI consumed by treatment B. Animals were weighed and blood sampled by jugular venipuncture on day -7, 0, 10, 14, 21, 28, and 35 relative to tick treatment. Tick treatment

consisted of 300 adult pair of *A. americanum* per animal. Total engorged (replete plus non-replete) female ticks were  $20.4 \pm 6.7$ ,  $97.6 \pm 19.6$ ,  $47.4 \pm 6.3$ ,  $34.3 \pm 3.6$ ,  $7.7 \pm 2.0$ ,  $7.3 \pm 2.0$ ,  $7.6 \pm 3.6$  for days 9 to 15 respectively. BW, ADG, and DMI as a percentage of BW were affected by day ( $P < 0.01$ ) but not treatment nor day by treatment. DMI as a percentage of BW for days 0 to 35 was calculated as a proportion of pre-treatment (day -7 to day -1) values. Proportional DMI during peak tick feeding was  $1.26 \pm 0.11$  vs  $1.23 \pm 0.10$ ,  $1.24 \pm 0.09$  vs  $1.14 \pm 0.04$ ,  $1.25 \pm 0.09$  vs  $1.11 \pm 0.04$ ,  $1.26 \pm 0.09$  vs  $1.14 \pm 0.04$ , and  $1.27 \pm 0.09$  vs  $1.12 \pm 0.04$  for A vs B, days 10 to 14 respectively ( $P > 0.1$ ). There were no differences ( $P > 0.1$ ) in IGF-1 or GLU due to treatment, day, nor day by treatment. LCT ( $P < 0.01$ ) and CS ( $P < 0.04$ ) were affected by day but not treatment nor day by treatment. Within treatment B, day 10 IGF-1 was positively correlated with days 9 to 11 cumulative non-replete female ticks ( $r^2 = 0.47$  to  $0.54$ ,  $P < 0.08$ ). Day 14 CS was positively correlated with days 10 to 11 cumulative non-replete female ticks ( $r^2 = 0.48$  and  $0.49$  respectively,  $P < 0.09$ ). Day 10 GLU was positively correlated with day 10 ( $r^2 = 0.53$ ,  $P = 0.06$ ) and day 11 ( $r^2 = 0.49$ ,  $P = 0.08$ ) cumulative replete female ticks. Day 14 GLU was positively correlated with days 9 to 15 cumulative replete ticks ( $r^2 = 0.68$  to  $0.83$ ,  $P < 0.02$ ). Day 10 LCT was positively correlated with day 9 ( $r^2 = 0.50$ ,  $P = 0.07$ ) replete and total ( $r^2 = 0.50$ ,  $P = 0.08$ ) female ticks. Day 14 LCT was positively correlated with day 11 ( $r^2 = 0.53$ ,  $P = 0.06$ ) non-replete female ticks. Metabolic indicators were related to the rate of tick engorgement on days 9 to 15.

**Key Words:** Metabolism, Tick, Intake

**89 Effects of a Lone Star tick (*Amblyomma americanum*) burden on growing beef steers: Near infrared spectra of feces.** D. R. Tolleson<sup>\*</sup>, J. W. Stuth, P. D. Teel, O. F. Strey, T. H. Welsh Jr, G. E. Carstens, and K. A. Dean, Texas Agricultural Experiment Station, College Station.

Previous studies have reported differences in fecal near infrared (NIR) spectra of livestock prior to, during, and after tick infestation, but feces from non-treated animals were not available for comparison. An experiment using 20 Angus crossbred, 9-month-old steers ( $254 \pm 6.1$  kg) examined the effects of a Lone Star tick infestation on fecal NIR spectra. Steers were randomly assigned to one of three groups: A) non-treated, *ad libitum*-fed, B) tick treated, *ad libitum*-fed, and C) non-treated, pair-fed, i.e. offered dry matter intake consumed by treatment B. Steers were fed a cottonseed hull-based diet ( $14.7 \pm 1.0$  % CP,  $58 \pm 1.2$  % TDN). Fecal samples were collected daily from 7 days pre- to 35 days post-tick treatment, which consisted of 300 adult pair of *A. americanum* per animal. Steers were kept in individual feeding stalls from day -7 to 21, in dry lot until day 35. Differences in fecal NIR spectra (1108 to 2492 nm) between groups were determined by a 2-block multiple partial least squares procedure. Differences in proportion of correct vs. incorrect group membership identification were determined by  $\chi^2$ . Total engorged (replete and non-replete) female ticks were  $20.4 \pm 6.7$ ,  $97.6 \pm 19.6$ ,  $47.4 \pm 6.3$ ,  $34.3 \pm 3.6$ ,  $7.7 \pm 2.0$ ,  $7.3 \pm 2.0$ ,  $7.6 \pm 3.6$  for days 9 to 15 respectively. Calibration samples were classified as either pre tick-feeding (PRE, day -2 to 2) or peak tick-feeding (PEAK, day 10 to 14). There were 30, 35, and 35 fecal NIR spectra in both PRE and PEAK for A, B, and C respectively. Ten randomly selected spectra in each group were withheld from calibration and used for validation. Discriminant equation results are listed in Table 1. More ( $P < 0.025$ ) B validation spectra were correctly identified (33 of 40) than A (29 of 40) or C (22 of 40). Differences in PRE vs PEAK fecal spectra were identified, but were not entirely attributable to tick burden. PRE and PEAK fecal spectra (n 100 each) from previous studies (bovine and equine) were combined with the current calibration set ( $R^2 = 0.89$ ,  $SECV = 0.35$ ). This equation correctly classified 17 of 20 validation spectra in both PRE and PEAK. Tick burdens appear to result in detectable changes to fecal NIR spectra in livestock.

Table 1.

Equation	R <sup>2</sup>	*SECV
A vs B Pre	0.60	0.55
A vs C Pre	0.22	0.61
B vs C Pre	0.09	0.49
A vs B Peak	0.71	0.42
A vs C Peak	0.83	0.39
B vs C Peak	0.70	0.43

\*SECV=SE of cross validation

**Key Words:** Near Infrared Reflectance Spectroscopy, Feces, Tick

**90 Effects of Component TES<sup>®</sup> and Revalor S<sup>®</sup> in a single implant or reimplant program on buller incidence, feedlot performance, and carcass characteristics of yearling steers.** B. L. Voyles\*<sup>1</sup>, M. S. Brown<sup>2</sup>, R. S. Swingle<sup>1</sup>, and K. J. Karr<sup>1</sup>, <sup>1</sup>Cactus Feeders, <sup>2</sup>West Texas A&M University.

Direct evidence of the potential influence of implant programs on buller incidence is lacking. Yearling steers (n = 4,352) were used in a randomized complete block design to evaluate the effects of implant type (Revalor S<sup>®</sup> [Rev S] and Component TES<sup>®</sup> [TES]; each containing 24 mg of estradiol-17 $\beta$  and 120 mg of trenbolone acetate) and timing of administration on buller incidence, feedlot performance, and carcass characteristics. Steers either received TES or Rev S on d 1, or 36 mg of zeranol (Ralgro<sup>®</sup>) on d 1 and TES (Ral/TES) or Rev S (Ral/Rev S) on d 50. Bullers pulled during the first 50 d were returned to home pens on d 50, and all steers were harvested after 144 d. The incidence of new bullers during the first 50 d did not differ (Chi-square statistic, P = 0.14) between steers receiving TES (2.3%), Rev S (1.75%), or Ralgro initially (1.42%; Ral/TES + Ral/Rev S). Administering Component compared to Revalor (P = 0.02; 0.97 vs 1.88%) and administering a single implant initially compared with an initial implant and a reimplant (P = 0.01; 0.92 vs 1.93%) resulted in fewer new bullers from d 50 to 144, but the overall incidence of new bullers did not differ (P > 0.43) among treatments. Neither implant type nor timing influenced the incidence of total (new + repull) bullers over the entire study (P > 0.43). Steer DMI (implant type x timing, P = 0.04) was least (P < 0.02) for Ral/TES, intermediate for TES, and greatest for Rev S and Ral/Rev S. Live and carcass-adjusted gain efficiency were 2.4% higher (P < 0.03) for steers receiving Component than for steers receiving Revalor. Reimplanting produced more dark (P < 0.01; 0.8 vs 0.2%) and Yield Grade 1 (P < 0.01; 26.3 vs 18.2%), and fewer Yield Grade 3 carcasses (P < 0.01; 33.1 vs 40.4%) than an initial implant only. Reimplanting increased the incidence of dark carcasses, resulted in more Yield Grade 1 and fewer Yield Grade 3 carcasses, and influenced when bullers developed. An initial implant or reimplant of Component improved gain efficiency, whereas overall buller incidence was not influenced by implant type or timing.

**Key Words:** Buller Steer Syndrome, Anabolic Implants

**91 Performance of market cows consuming composted broiler litter, corn or soyhulls, and hay.** S. M. DeRouen\*<sup>1</sup>, D. W. Sanson<sup>2</sup>, and D. H. Foster<sup>3</sup>, <sup>1</sup>Louisiana State University Agricultural Center, Homer, <sup>2</sup>Louisiana State University Agricultural Center, Rosepine, <sup>3</sup>Louisiana Department of Agriculture, Baton Rouge.

The objective of this study was to evaluate over a 3 yr period the potential of feeding cull cows various broiler litter based diets. Sixty-five to 81 thin cows were purchased each fall from area livestock auction barns and transported to the Hill Farm Research Station. Cows (mean initial BW = 461 kg and mean initial body condition score (BCS) = 4.09) were allocated by BW and BCS to eight paddocks with two replicates for each of four treatments (TRT). The TRT were: 1) 80% composted broiler litter (BL) and 20% ground corn (C); 2) 80% BL and 20% soyhulls (S); 3) 70% BL and 30% C; and 4) 70% BL and 30% S. All TRT rations were offered free-choice and supplemented with free-choice hay. Length of feeding trials ranged from 99 to 113 d. Five to 13 cows per trial were removed from the study each year due to death, health problems or calving during the trial. Cows were weighed on two consecutive days and scored for BCS at the beginning and end of each trial. Statistical analyses were conducted using a generalized linear mixed model procedure. Cow purchase price did not differ (P = 0.08) among TRT with an overall average of \$0.79 per kg. Least squares means for ADG by TRT 1, 2, 3, and 4 were: 0.41, 0.35, 0.47, and 0.40 kg (pooled SE = 0.03 kg), respectively, and were not different (P = 0.13). Means for BCS change over the trial period by TRT 1, 2, 3, and 4 were: 0.70, 0.47, 0.72, and 0.60 (pooled SE = 0.09), respectively, and did not differ (P = 0.27). Ending BW differed (P < 0.05) by TRT and were 500, 496, 517, and 500 kg (pooled SE = 4.68 kg) for TRT 1, 2, 3, and 4, respectively. There was no difference (P = 0.16) among TRT means for daily ration consumption (not including hay) and were 4.52, 4.59, 6.28, and 5.73 kg (pooled SE = 0.58 kg) for TRT 1, 2, 3, and 4, respectively. At the end of each trial, cows were transported to a local livestock auction barn and sold. There was no difference (P = 0.11) among TRT in sale price with an overall average of \$0.99 per kg. In conclusion, weight gains, body

condition score increases, and feed consumption were similar when market cows were fed composted broiler litter with varying levels of either corn or soyhulls.

**Key Words:** Beef Cattle, Broiler Litter, Cull Cows

**92 Wheat pasture bloat dynamics and mitigation with tannins.** B. R. Min\*<sup>1</sup>, W. E. Pinchak<sup>1</sup>, J. D. Fulford<sup>1</sup>, R. Puchala<sup>2</sup>, and R. J. Gill<sup>1</sup>, <sup>1</sup>Texas A & M Agricultural and Extension Center, Vernon, TX, <sup>2</sup>E (kika) de la Garza American Institute for Goat Research, Langston, OK.

The aim of this study was to determine the effect of winter wheat (*Triticum aestivum* L.) forage chemical composition, stage of growth (SG; vegetative (VS; January-February) or reproductive stage (RS; March-April)), forage allowance (FA; high or low), time of day, and commercial condensed tannins (CT; Quebracho) on in vitro rumen gas production (RGP) and steer bloat score (BS). Twenty-six Angus x Hereford crossbred steers (194  $\pm$  26 kg BW) were used. Wheat FA was 18 (high-FA) and 6 kg (low-FA) DM/100 kg BW/d. Bloat was scored weekly on two consecutive days at 0800 and 1500 during VS and biweekly during RS. Hand plucked forage samples were collected at the time of BS. The RGP was measured using an anaerobic in vitro rumen incubation (39 °C) procedure with 5 g of minced forage in 250 ml volumetric flasks containing 20 ml of ruminal fluid and 20 ml of artificial saliva (pH 6.8). The RGP was monitored at 0, 1, 2, 3, 4, 5, 6, and 12 h and methane gas production (MGP) was measured at 12 h. Flask stoppers were equipped with rubber tubing connected to 60 ml syringes. The CT were added at 0, 10, 15, and 20 mg CT/g DM. Forage mass was greater for high-FA (2,140 kg DM/ha) than for low-FA (707 kg DM/ha). When forage was incubated with ruminal fluid, the rate of RGP was higher (P < 0.001) for VS (15.9 ml/h) than for RS (7.2 ml/h). The low-FA greatly increased (4.4 vs 3.6 ml/h; P < 0.05) in vitro MGP, but low-FA reduced BS (0.1 vs 0.34; P < 0.01). Correlation coefficients (r) between RGP, BS and forage nutrients indicated that CP (0.48), non-protein nitrogen (0.40), soluble protein (0.32) and IVDMD (0.47) were positive by association (P < 0.01) with rate of RGP; were negative association observed for DM (-0.20; P < 0.05), insoluble protein (-0.40), NDF (-0.69), and forage height (-0.49; P < 0.01). The CP (0.22; P < 0.05) and SG (0.43; P < 0.01) were positive by association with BS. Addition of CT between 15 and 20 mg CT/g DM reduced (P < 0.01) rate of RGP and MGP, although levels of 10 mg CT/g DM or less had no effect. In conclusion, wheat forage bloat is a complex disorder in which a several factors must be present before bloating can occur. The CT may have potential to aid in the control of bloat.

**Key Words:** Bloat and Rumen Gas, Wheat Forage, Tannins

**93 Effects of a dietary sweetener on feedlot performance and carcass characteristics of beef steers.** C. D. Drager\*<sup>1</sup>, M. S. Brown<sup>1</sup>, E. M. Cochran<sup>1</sup>, E. A. Lauterbach<sup>1</sup>, T. J. Biggs<sup>1</sup>, and W. Rounds<sup>2</sup>, <sup>1</sup>Division of Agriculture, West Texas A&M University, <sup>2</sup>Prince Agri Products, Inc.

Two experiments were conducted to evaluate the efficacy of a dietary sweetener for feedlot beef steers. In Exp. 1, 220 male calves (191  $\pm$  2 kg BW; 75% bulls) were used to assess the time course of the effect of graded levels of Sucram C-150<sup>®</sup> (97% Na-saccharin) on performance and health. Calves were processed on arrival, stratified by castration (arrived as steer or bull) and horn (polled or dehorned) status, and assigned randomly to ad libitum access of a common basal diet (14% CP, 1.25 Mcal of NEg/kg of DM) supplemented to contain 0, 88, 176, or 264 g of Sucram/ton of diet DM (4 pens/treatment). Unshrunk BW was determined weekly for four weeks, and final BW was obtained on d 56 after feed and water had been removed for 24 and 12 hours, respectively. The effects of treatment and time did not interact (P > 0.98) for performance data. Overall DMI was 17% greater (P = 0.04) for steers receiving 176 g of Sucram/ton than for steers fed the control diet (3.69, 3.72, 4.32, and 3.86  $\pm$  0.4 kg/d for 0, 88, 176, and 264 g/ton, respectively). Overall ADG and ADG:DMI were similar (P > 0.18) among treatments, but ADG was numerically 23% greater for steers receiving 176 g of Sucram. Water disappearance/kg of DMI was less (P = 0.06) for steers receiving 264 g of Sucram (5.34, 5.08, 5.03, and 4.47  $\pm$  0.39 L/kg). The number of calves receiving antibiotic therapy once (average = 50.3%) or more

than once for respiratory disease did not differ (Chi-square statistic,  $P > 0.36$ ) among treatments. In Exp. 2, 39 crossbred steers ( $486 \pm 42$  kg BW) were used to evaluate the effect of Sucram C-150<sup>®</sup> on feedlot performance and carcass characteristics of finishing steers. Steers were offered ad libitum access to water and a common 90% concentrate diet supplemented to contain 0 or 180 g of Sucram/ton of diet DM (3 pens/treatment). Feedlot performance and carcass characteristics were not influenced ( $P > 0.22$ ) by inclusion of Sucram. Sucram C-150<sup>®</sup> fed at 176 g/ton of DM increased dry matter intake by stressed beef calves throughout a 56-d receiving period; however, supplemental Sucram did not improve performance by heavy yearling steers during the finishing period.

**Key Words:** Saccharin, Sweetener, Feedlot Performance

**94 Intake and digestibility of hay fed to beef cows supplemented with de-oiled rice bran.** T. C. Losi<sup>2</sup>, S. A. Gunter<sup>\*1</sup>, P. A. Beck<sup>1</sup>, S. Hutchison<sup>1</sup>, M. S. Gadberry<sup>3</sup>, and P. Capps<sup>1</sup>, <sup>1</sup>University of Arkansas Southwest Research & Extension Center, Hope, <sup>2</sup>Universidade Estadual Paulista - Faculdade de Medicina Veterinária e Zootecnia, Botucatu, SP Brasil, <sup>3</sup>University of Arkansas Cooperative Extension Service, Little Rock.

Twelve gestating beef cows ( $557 \pm 40$  kg) were individually housed in pens at the South West Research and Extension Center feedlot with ad libitum access to chopped (5 to 10 cm) bermudagrass/dallisgrass hay (6.9% CP; 49.1% TDN) and assigned to one of four treatments: 1) no supplement or de-oiled rice bran (DORB) offered at 2) 0.46, 3) 0.70, or 4) 0.93% of BW (DM basis). Cows were adapted to the diets for 13 d, followed by a 5-d collection period. Hay, DORB, and feces were sampled daily during the collection period and composited across days. Hay and DORB DMI were measured directly and digestibilities were estimated using AIA as an internal marker. The digestibility of hay DM, NDF, and ADF were determined by difference, assuming the digestibility of DORB DM, NDF, and ADF were 58.2, 36.2, 20.4%, respectively, as determined by 48-h in situ digestion. Data were analyzed as a completely random design and least-square means were separated using linear, quadratic, and cubic contrasts for unequally spaced treatments. Hay DM (10.9, 10.4, 8.2, and 8.3 kg/d, SE = 1.6, respectively), NDF (8.4, 8.0, 6.4, and 6.4 kg/d, SE = 1.2), and ADF (4.4, 4.2, 3.4, and 3.4 kg/d, SE = 0.6) intake were not affected ( $P > 0.19$ ) by level of DORB. De-oiled rice bran DM, NDF, and ADF intake increased linearly ( $P < 0.01$ ) as designed; however, total intake of DM (10.9, 12.7, 11.6, and 12.8 kg/d, SE = 1.6), NDF (8.4, 8.9, 7.8, and 8.2 kg/d, SE = 1.2), and ADF (4.4, 4.4, 3.8, and 3.9 kg/d, SE = 0.6) did not differ ( $P > 0.42$ ) among treatments. Digestibility of total dietary DM (56.3, 56.3, 59.5, and 57.8%, SE = 0.9) responded cubically ( $P = 0.05$ ), but NDF (59.2, 58.8, 59.3, and 57.9%, SE = 0.9) and ADF (56.9, 56.7, 55.5, and 53.1%, SE = 1.0) did not differ ( $P > 0.18$ ) with level of DORB. Digestibility of hay DM (56.3, 56.4, 60.3, and 57.4%, SE = 1.2) responded cubically ( $P = 0.03$ ) and NDF (59.2, 61.3, 64.3, and 64.3%, SE = 1.7) increased linearly ( $P < 0.01$ ); however, digestibility of ADF in hay (56.9, 58.8, 59.9, and 58.1%, respectively) did not differ ( $P > 0.40$ ). These data support findings reported in production research where little or no change is noted in hay or total dietary DMI even though performance was improved, probably resulting from increased fiber digestion.

**Key Words:** Beef Cattle, Rice Bran, Forages

**95 Relationship between measures of cow and calf temperament and live animal body composition traits in calves at weaning.** R. C. Vann<sup>\*1</sup>, J. F. Baker<sup>2</sup>, and R. D. Randel<sup>3</sup>, <sup>1</sup>MAFES-Brown Loam Experiment Station, <sup>2</sup>University of Georgia-Tifton Campus, <sup>3</sup>Texas Agricultural Research & Extension Center.

The objectives of this study were to evaluate effects of sire and gender on exit velocity (EV, m/s), chute temperament score (CS; 1=calm, no movement to 5=jumping and rearing; highly agitated) and pen temperament score (PS; 1=non-aggressive, not excited by humans to 5=aggressive, runs into fences and at humans if approached) and measure relationships between EV, CS and PS with live animal body composition traits at weaning. Crossbred calves ( $n=113$ ) were assigned a PS. Cows and calves were weighed (calves were assigned a CS), restrained in a squeeze chute then released and time recorded to travel 1.83 m. Sire consisted of one Brangus and six Angus sires. Least square means were obtained from PROC Mixed with main effects of sire and gender.

Sire was not a significant source of variation for EV and PS, but was for CS, weaning weight, weight per day of age, longissimus muscle area (LMA), back fat (BF), intramuscular fat (IMF), gluteus medius depth and rumpfat at weaning. Gender was a significant source of variation for EV (steers  $1.80 \pm 0.21$  and heifers  $2.53 \pm 0.19$  m/s,  $P < 0.001$ ) and PS (steers  $2.79 \pm 0.17$  and heifers  $3.18 \pm 0.15$ ,  $P < 0.02$ ). The  $r$  between calf EV and PS was 0.26 ( $P < 0.007$ ), and LMA per body weight (LMACWT) was 0.29 ( $P < 0.003$ ). The  $r$  between calf EV and dam EV was 0.34 ( $P < 0.001$ ) at weaning. The  $r$  between PS and LMA, LMACWT and BF was 0.22, 0.21, and 0.25, respectively ( $P < 0.04$ ). In conclusion, sire was not a significant source of variation in exit velocity; however, differences existed between steers and heifers. Sire and gender of calf did influence body composition at weaning. The moderate association between measurements of temperament and body composition would suggest that larger calves tended to be faster and less calm. Although correlation coefficients between velocity and temperament scores were significantly different from zero the magnitudes were only moderate. Dam EV had the strongest correlation with calf EV.

**Key Words:** Body Composition, Temperament, Weaned Calves

**96 Investigation of factors influencing feedlot performance and profitability in the 2001-2002 Texas A&M Ranch to Rail program-South.** K. W. Harborth<sup>\*</sup>, A. D. Herring, and J. C. Paschal, Texas A&M University.

Data from the 2001-2002 Texas A&M University Ranch to Rail Program-South were used to determine factors that influence cattle feedlot performance and profitability. Steers ( $n=860$ ) were classified by sire (SBIO) and dam (DBIO) biological groups, kill groups (KILL), and entry month (ENTRYMON), and determined by the predominant genetic make up of the sire or dam. Traits evaluated included net income (NI), feedlot average daily gain (ADG), slaughter weight (OUTWT), carcass weight (CW), fat thickness (FT), longissimus muscle area (LMA), marbling score (MS), yield grade, (YG), medicine costs (TOTMED), and carcass value (CVL). Analyses of covariance were performed to determine differences between SBIO and DBIO, KILL, and ENTRYMON, and the influence of initial feedlot weight (INWT). SBIO had a significant effect on NI, ADG, FT, LMA, MS, YG, and CVL. DBIO and KILL had significant effects on all traits excluding TOTMED. ENTRYMON accounted for no differences. Among SBIO groups, British-sired steers exhibited greatest values for ADG (1.39 kg/d), MS (457), FT (1.45 cm), CVL (891), and NI (25.62). Continental-sired steers exhibited the largest LMA (97.65 cm) and lowest YG (2.51). Brahman-sired steers exhibited the lowest ADG (1.32 kg/d), MS (405), CVL (859), and NI (-17.80). Multiple regression was performed to determine which traits had the greatest effect on CVL and NI. Independent categorical effects were SBIO, DBIO, KILL and ENTRYMON, while independent continuous effects were INWT, ADG, FT, LMA, MS and TOTMED. Both CVL and NI were influenced by CW, FT, LMA, and MS, but not by ADG, INWT, or TOTMED. Phenotypic correlation coefficients were determined among all traits. Highest correlations were present between CVL: and NI, CW, ADG, and LMA (0.80, 0.81, 0.54, and 0.49, respectively). Strong correlations were seen between ADG and CW (0.63), FT and YG (0.87) and YG and LMA (-0.51). MS was moderately correlated to CVL (0.30) and NI (0.30). This study indicates that a wide variety of traits interact to determine CVL and NI in retained ownership programs, and that maximizing carcass value does not ensure increased profitability.

**Key Words:** Biological Type, Beef Carcasses, Retained Ownership

**97 Weaning date and pasture rotation frequency effects on forage measurements and performance by fall-born calves grazing tall fescue pastures.** K. P. Coffey<sup>\*</sup>, W. K. Coblenz, T. F. Smith, J. E. Turner, D. S. Hubbell, III, D. A. Scarbrough, B. C. McGinley, and C. F. Rosenkrans, Jr., University of Arkansas.

Dilution of *Neotyphodium coenophialum* infected tall fescue (IF) pastures with non-toxic forages still remains the most widely-accepted management recommendation to reduce the impacts of tall fescue toxicosis. Our objective was to evaluate the impact of pasture rotation frequency (twice monthly = 2X vs. twice weekly = 8X) and weaning date (mid April = EARLY vs. early June = LATE) on forage species composition and performance by fall-calving cow-calf pairs grazing IF overseeded with crabgrass, ladino and red clover, and lespedeza. Sixty cows (495

± 9.6 kg initial BW) were allocated randomly by BW and age to one of eleven IF pastures in early April 2000. Pasture groups were allocated randomly to either 2X or 8X and half of each rotation frequency was allocated randomly to EARLY or LATE in a 2 × 2 factorial treatment arrangement. Soil pH, organic matter, and most forage mineral concentrations did not differ ( $P > 0.05$ ) among treatments. Basal forage cover was greater ( $P < 0.05$ ) from 2X vs. 8X. Across treatments and sampling dates, fescue dominated the forage canopy, crabgrass composition averaged greater than 10%, red and ladino clover compositions were each below 1%, and lespedeza averaged approximately 4% of the species composition. As expected, actual weaning weight was lower ( $P < 0.05$ ) from EARLY vs. LATE, but was not impacted ( $P > 0.10$ ) by rotation frequency. LATE calves were 33 kg heavier ( $P < 0.05$ ) than EARLY on the LATE weaning date because of slower gain by EARLY during the period between weaning dates, but age-adjusted 205-d weaning weights did not differ ( $P < 0.10$ ) among treatments. Therefore, at the end of three calf cycles and four years of grazing, rotational grazing management has had little impact on forage species composition and calf performance, and weaning calves in mid-April appears to have negative effects on calf performance that extend beyond the immediate weaning process.

**Key Words:** Tall Fescue, Cattle, Forage Management

**98 Digestibility and protein utilization in steers fed corn and pearl millet diets.** G. M. Hill<sup>\*1</sup>, W. W. Hanna<sup>2</sup>, B. C. Hand<sup>1</sup>, A. E. Coy<sup>1</sup>, and B. G. Mullinix, Jr.<sup>1</sup>, <sup>1</sup>University of Georgia, Coastal Plain Expt. Sta., Tifton, GA/USA, <sup>2</sup>USDA-ARS, Coastal Plain Expt. Sta., Tifton, GA/USA.

A pearl millet grain (PM; 'Tifgrain 102') diet (PD) was compared with corn-soybean meal (CS) and corn-PM (CPM) diets individually-fed for 24 d to growing beef steers (n = 20; BW 274.3 ± 13.5 kg; age 11 mo) to determine digestibility and protein utilization. Steers were ranked by initial BW and randomly assigned to treatments. Ground corn, ground PM, soybean meal (SBM), cottonseed hulls, and minerals (%), respectively, in diets were: CS = 79.0, 0.0, 5.0, 15.0, 1.0; CPM = 42.0, 42.0, 0.0, 15, 1.0; PD = 0.0, 0.0, 84.0, 15.0, 1.0. The DM, CP, and calculated TDN (%), respectively, for diets were: CS = 86.6, 12.6, 80.0; CPM = 87.6, 12.4, 80.0; PD = 88.6, 14.8, 79.0. The PM grain contained 90.8 % DM, 15.8 % CP and 86.0% TDN. Diets were limited to 4.55 kg DMI fed in split AM and afternoon feedings. Chromic oxide (10 g/steer daily) was fed from d 14 to d 24, and fecal samples (12/steer during d 19 to d 24) were analyzed for Cr and nutrients. Steer jugular blood samples were drawn at 4 h and 8 h after the AM feeding on d-24, and analyzed for plasma urea nitrogen (PUN; mg/dl; all steers), and plasma amino acid (PAA; umol/ml; n = 4 steers/treatment). Sampling time did not affect ( $P > 0.10$ ) PUN or PAA concentrations, and PUN, plasma LYS, MET, THR, and total essential amino acids (TEAA), respectively, by CS, CPM and PD, were: PUN 6.3<sup>b</sup>, 7.0<sup>b</sup>, 9.1<sup>a</sup>, SE 0.8; LYS 12.0, 12.2, 9.4, SE 1.2; MET 3.9<sup>c</sup>, 3.0<sup>d</sup>, 2.9<sup>d</sup>, SE 0.3; THR 14.3, 12.8, 13.6, SE 1.0; TEAA 166.7, 160.4, 165.5, SE 8.2; means with different superscripts differ, a or b ( $P < 0.01$ ); c or d ( $P < 0.05$ ). Total tract digestion coefficients (%) by CS, CPM, and PD, respectively, were: OM 72.0<sup>a</sup>, 59.4<sup>b</sup>, 63.1<sup>b</sup>, SE 1.7; CP 70.7<sup>a</sup>, 54.6<sup>c</sup>, 63.2<sup>b</sup>, SE 1.7; NDF 27.0, 19.6, 27.6 SE 3.9; means with different superscripts differ ( $P < 0.01$ ). Steers fed PD had elevated PUN, reflective of higher dietary CP, however, plasma MET, and both OM and CP digestion were lower for CPM and PD than CS. Protein quality of PM grain was apparently lower than corn and SBM used in CS, resulting in lower digestibility of the PD diet.

**Key Words:** Millet, Steer, Digestion

**99 Performance of yearling stocker cattle of different biological types in a management-intensive grazing system.** M. L. Thomas<sup>\*</sup>, D. W. Kellogg, A. H. Brown, Jr., Z. B. Johnson, and C. P. West, University of Arkansas.

Yearling beef heifers (36) and steers (33) representing four biological size and maturity types typical of commercial stocker cattle in North-west Arkansas were evaluated for growth performance on cool-season annual pastures. A management-intensive grazing system in a 112-d trial during the spring of 2003 was replicated three times. A variable stocking rate was utilized with daily paddock allocation based on forage availability. Twenty-three animals in each group grazed an average of 3.09 hectares for a stocking rate of 0.66 animal units per ha. Forages

included wheat (*Triticum aestivum*), annual ryegrass (*Lolium multiflorum*), and white clover (*Trifolium repens*). Overall trial mean crude protein (CP) was 15.26% and forage availability 2,811 kg/ha. Biological types included the potential for large frame, late maturing (LL), medium-frame, late maturing (ML), medium frame, intermediate maturing (MI) and medium-frame, early maturing (ME) calves. Animal performance measures including weight, hip height, body depth, body condition score, and temperament score were taken approximately every 28 d. Data were analyzed by ANOVA with unequal subclass numbers. The LL animals were greater ( $P < 0.05$ ) in hip height than the ML, with the ML being greater ( $P < 0.05$ ) in hip height than both MI and ME. Steers had greater ( $P < 0.05$ ) body depth measures than heifers. Overall ADG was 1.0 kg/d but showed a sex by biological type interaction ( $P < 0.05$ ). The ADG of LL steers was 1.19 kg/d, whereas LL heifers gained only 0.84 kg/d. Animal temperament may have been a factor because steers were less excitable ( $P < 0.05$ ) than heifers. Body condition score did not vary ( $P < 0.05$ ) by biological type. Total animal gains were 823.5 kg/ha. These data suggest that biological type and sex should be considered in production systems involving yearling beef cattle under management-intensive grazing.

**Key Words:** Management-Intensive Grazing, Stocker Cattle, Biological Type

**100 Byproduct-based diets for finishing beef steers.** M. H. Poore<sup>\*</sup>, North Carolina State University.

A study was conducted to evaluate three diets for finishing cattle in western North Carolina. Angus-cross steers (initial wt 406 kg) were assigned to 8 pens (15 hd/pen). Diet 1 (3 pens) contained 40% wet corn gluten feed (WCGF), 20% soyhulls (SH), 10% cottonseed hulls, 27% corn screenings and 3% minerals (dry basis). Diet 2 (3 pens) was similar to diet 1 except that it contained 25% WCGF and 15% waste blanched white beans. Diet 3 (2 pens) consisted of a concentrate containing 47.5% corn gluten feed pellets, 47.5% SH, 1.5% brewers' condensed solubles and 3.5% minerals (dry basis), and cattle had free access to grass hay. All mixed feeds contained 33 mg/kg monensin (dry basis). Diets 1 and 2 were fed once daily leaving minimalorts, while diet 3 was fed well in excess of intake to simulate self-feeding. After 100 d on feed, 7 or 8 head from each pen (based on visual evaluation) were shipped 1150 km for harvest. After an additional 28 d the remaining cattle were shipped. The 3 respective mixed feeds (dry basis) were 14.4, 14.8 and 14.1% CP, and 20.3, 20.6 and 30.2% ADF, while hay was 8.7% CP and 39.8% ADF. The LS means with SEM are reported. Total DMI was higher ( $P < 0.05$ ) for diets 1 and 3 than diet 2 (13.8, 14.5 and 11.9 ± 0.22 kg/d, respectively). Cattle on diet 3 ate 2.65 kg/d hay. Carcass-adjusted ADG was higher ( $P < 0.05$ ) for diet 1 than diet 2 or 3 (1.93, 1.52 and 1.57 ± 0.043 kg/d, respectively). Carcass wt was higher ( $P < 0.05$ ) for diet 1 than diet 2 or 3 (391, 360 and 366 ± 3.5 kg, respectively). Feed:gain was lower ( $P < 0.05$ ) for diet 1 and 2 than for diet 3, and tended to be lower ( $P = 0.09$ ) for diet 1 than for diet 2 (7.19, 7.78 and 9.22 ± 0.204, respectively). Quality grade was not influenced by diet and averaged low choice. Yield grade was higher ( $P < 0.06$ ) for diet 1 than for diet 2 and 3 (3.37, 3.10 and 3.00 ± 0.08, respectively). Ribeye area was larger ( $P < 0.05$ ) for diet 1 than for diet 2, and diet 3 was intermediate (91.0, 85.8 and 88.6 ± 1.3 cm<sup>2</sup>, respectively). All 3 diets resulted in acceptable performance, but substituting beans for WCGF reduced DMI and gain. The self-fed ration may be feasible depending on ingredient prices, but it reduced feed efficiency compared to the other diets.

**Key Words:** Finishing, Byproducts, Beef Cattle

**101 Relationships between temperament and growth traits in crossbred steers.** R. C. Vann<sup>\*1</sup>, B. Macoon<sup>1</sup>, J. D. Perkins<sup>1</sup>, and R. D. Randel<sup>2</sup>, <sup>1</sup>MAFES-Brown Loam Experiment Station, <sup>2</sup>Texas Agricultural Research and Extension Center.

Forty-four crossbred steers were randomly assigned according to BW and breedtype to one of three tall fescue (*Festuca arundinacea* Schreb.) forages [novel endophyte-infected "Georgia 5" (GA5) and "Jesup" (JES), and endophyte-free "Kentucky 31" (KY31)] and ryegrass (*Lolium multiflorum* Lam.; RG) with two replications (REP) per forage. One objective of this study was to evaluate effects of sire breed on exit velocity (EV, m/s), chute temperament score (CS; 1=calm to 5=highly agitated) and pen temperament score (PS; 1=non-aggressive to 5=aggressive). A second objective was to determine relationships between EV, CS and PS

with BW, total gain (GAIN), body composition traits (longissimus muscle area (LMA), back fat (BF), intramuscular fat (IMF), gluteus medius depth (GMD) and rumpfat), and average daily gain (ADG) at 28-d intervals over a 168-d grazing period. At weaning, calves were assigned a PS, weighed on a platform scale and assigned a CS, then restrained in a squeeze chute, released and time recorded to travel 1.83 m. Least square means were obtained from PROC Mixed with main effects of sire breed, REP and forage type. Breed of sire was not a significant source of variation for GAIN, ADG, BW, body composition traits, EV, PS or CS. The type of forage steers grazed affected ( $P < 0.04$ ) GAIN, ADG, BW, LMA, BF, GMD and IMF ( $P = 0.062$ ). The regression coefficient for EV with BW was  $-0.002$  kg ( $P < 0.04$ ), GAIN was  $-0.007$  kg ( $P = 0.074$ ), and ADG was  $-0.18$  kg ( $P = 0.074$ ). The regression coefficient for PS with BW was  $-0.0015$  kg ( $P = 0.07$ ), GAIN was  $-0.007$  kg ( $P = 0.073$ ), and ADG was  $-0.19$  kg ( $P = 0.071$ ). The correlation coefficient ( $r$ ) between EV and PS was  $0.47$  ( $P < 0.001$ ). The  $r$  between PS and BF and RF at 168-d was ( $-0.31$  and  $-0.32$  cm, respectively;  $P < 0.001$ ); and the  $r$  between EV and BW was ( $-0.13$  kg;  $P < 0.04$ ). The moderate association between measurements of temperament and body composition traits would suggest that temperamental calves have reduced growth performance and body composition after a 168-d grazing period.

**Key Words:** Temperament, Forages, Steers

### 102 Effects of a sunflower seed supplement on performance and reproduction of beef cows and their progeny. J. P. Banta\*, D. L. Lalman, and R. P. Wettemann, *Oklahoma State University*.

An experiment was conducted to determine the effects of supplementing whole sunflower seed during late gestation on performance of beef cows as well as feedlot performance and carcass traits of their progeny. During late gestation, 160 multiparous spring calving beef cows (mean: 588 kg; BCS 5.6; age 4-13 yr) were fed one of three supplements for 76 d. Supplements included: 1) 0.95 kg/d of whole sunflower seed (WSUN; CP = 22%, EE = 44%, DM); 2) 0.39 kg/d of soybean meal (NCON; DM); and 3) 1.72 kg/d of a soybean hull based supplement (PCON; DM). Each supplement was formulated to provide similar amounts of CP and DIP; PCON and WSUN were also formulated to be isocaloric. During the treatment period, cows had *ad libitum* access to bermudagrass and prairie hay. By the end of the supplementation period, cows consuming PCON and NCON had gained more ( $P < 0.05$ ) BW than cows consuming WSUN (33, 22, and 10 kg, respectively). From the end of the treatment period to the beginning of the breeding season, PCON supplemented cows lost more ( $P < 0.01$ ) BW than WSUN supplemented cows ( $-123$  kg and  $-111$  kg). Furthermore, cow body condition scores were not significantly different among treatments at the end of the supplementation period (5.3), at the start of the breeding season (4.8) or at weaning (4.7). No differences among treatments were observed for calf birth weight (36 kg;  $P = 0.40$ ), calf weaning weight (235 kg,  $P = 0.43$ ), percent of cows cycling at the start of the breeding season (57%;  $P = 0.29$ ) or pregnancy rate (89%;  $P = 0.46$ ). However, first service conception rate was improved ( $P < 0.06$ ) for PCON (79%) and WSUN (75%) compared to NCON (55%) treated cows. After weaning, steer calves were placed in a feedlot for an average of 188 d until harvest. No significant differences among treatments were observed for feedlot performance or carcass traits. In this experiment, no advantages or negative effects on cow or calf performance were observed with whole sunflower seed supplementation, compared to an isocaloric soybean hull based supplement.

**Key Words:** Beef Cows, Fat Supplementation

### 103 Calving primiparous Braford heifers at two- versus three-years of age. S. Galindo-Gonzalez\*<sup>1,2</sup>, J. D. Arthington<sup>1</sup>, S. W. Coleman<sup>3</sup>, and A. de Vries<sup>2</sup>, <sup>1</sup>University of Florida, Range Cattle Research and Education Center, Ona, <sup>2</sup>University of Florida, Department of Animal Sciences, Gainesville, <sup>3</sup>USDA-ARS Subtropical Agricultural Research Station, Brooksville.

The objective of this study was to determine the performance of postpartum, primiparous Braford heifers at two- vs three-yr of age. For comparison purposes, mature, multiparous Braford cows were also included in the study. The experiment was conducted for 84 d at the Range Cattle Research and Education Center, Ona, FL. Four cows and their calves were randomly selected from one of three age groups ( $n$

$= 12$ ; four pairs/age group), consisting of mature, three-, and two-yr-old cows. Each pair was randomly allocated to an individual pen, in a completely randomized design. All pens were fed a daily ration of concentrate and forage (45:55, respectively), according to NRC (1996). Forage and concentrate were 52 and 75% TDN, and 13 and 12% CP (DM basis), respectively. Body condition score (BCS; 1 to 9 scale), BW, and milk production data were collected from all cows on d 0, 42, and 84. Backfat thickness was measured on d 0 and 84 using ultrasonography. The calves were weighed on d 7, 42 and 84. At d 0, two-yr-old cows were lighter ( $P < 0.05$ ) than mature cows. Throughout the study, mature cows lost more BW ( $P < 0.01$ ) than the other groups ( $-0.42$ ,  $0.04$ , and  $0.17$  kg/d for mature, two, and three-yr-old cows, respectively; SEM =  $0.08$ ). Two-yr-old cows had a greater ( $P < 0.05$ ) BCS when compared with the other groups on d 42, and when compared to the three-yr-old cows ( $P < 0.05$ ) on d 84. Production of 4% fat corrected milk (FCM) tended ( $P < 0.09$ ) to be less at d 0 for two-yr-old than mature cows (4.46 and 6.67 kg/d; SEM =  $1.17$ ), and by d 42, FCM production of two-yr-old cows was less ( $P < 0.05$ ) than both three-yr-old and mature cows (6.28, 6.74, and 4.19 kg/d for mature, three-, and two-yr-old cows respectively; SEM =  $1.17$ ). No differences ( $P > 0.10$ ) were detected in calf BW and ADG. When provided a similar level of nutrition, primiparous Braford heifers calving at two-yr of age tend to have a lesser FCM production than multiparous heifers calving at three-yr of age. Further studies are needed to examine the economic impacts of calving primiparous heifers at two- vs three-yr of age.

**Key Words:** Heifer, Calf, Supplementation

### 104 Effect of different levels and oscillating digestible intake protein on performance and blood urea nitrogen concentration of beef calves. R. Shanklin\*, G. Scaglia, and J. P. Fontenot, *Virginia Polytechnic Institute and State University*.

Oscillating the amount of digestible intake protein in beef cattle diets can reduce the amount of N required to be fed and improve N utilization. Forty-eight Angus crossbred steers (BW =  $235 \pm 2.9$  kg) were allotted randomly to six treatments which included three levels of DIP (60, 80, and 100% of daily requirements) and oscillating between 60 and 100% of the requirements every 48, 72, and 96 h. Steers were individually fed a high-roughage diet containing 11% CP, and formulated to allow a daily gain of 0.65 kg for 126 d. Average diets contained 51% barley straw, 37% corn, and 5% molasses. Soybean meal, feather meal, and urea were used to achieve the DIP contents of the diets. Blood samples were obtained from steers fed the oscillating treatments three times during the experimental period after receiving the 60% DIP diet and three times after receiving the 100% DIP diet. At those times, blood samples were also obtained from steers fed the 60, 80, and 100% DIP treatments. Daily DMI, ADG, and gain efficiency were similar ( $P > 0.05$ ) for the cattle fed the 60, 80, and 100% DIP diets. Average daily gains tended ( $P = 0.20$ ) to be higher for oscillating DIP levels at 96 h intervals. When sampling after 48, 72, and 96 h of feeding the diet that satisfied the DIP requirements (100%), BUN was higher ( $P < 0.01$ ) for the oscillating treatments (8.96, 10.86, and 10.04 mg/dl for 48, 72, and 96 h, respectively) and for the 100% diet (8.80, 10.52, and 10.06 mg/dl), compared to the treatments 60 (6.11, 6.36, and 7.40 mg/dl) and 80% (6.48, 7.71, and 7.61 mg/dl) DIP diets fed continuously. When sampling after 48, 72, and 96 h of feeding the 60% DIP diet, the 96 h oscillating treatment had the lowest ( $P < 0.05$ ) BUN (5.52 mg/dl). In this experiment, feeding less DIP than recommended did not affect performance, while oscillating DIP levels allowed maintenance of appropriate levels of blood urea nitrogen.

**Key Words:** Digestible Intake Protein, Oscillating Protein, Blood Urea Nitrogen

### 105 The effects of antimicrobial use on the performance of newly received cattle. S. Hutchison\*, P. A. Beck, and S. A. Gunter, *University of Arkansas Southwest Research & Extension Center, Hope*.

Concerns over antimicrobial resistance in animal husbandry are a growing concern; hence, producers are re-evaluating their drug use protocols. A 56-d trial was conducted to determine the effects of feeding an antimicrobial and bovine respiratory disease (BRD) treatment protocol on the performance of newly received cattle. Crossbred steer (37%) and bull (63%) calves ( $n = 84$ ; BW =  $216 \pm 3.4$  kg) were purchased at sale barns

in southwest Arkansas, transported to the Southwest Research & Extension Center feedlot, and processing by weighing, castration of bulls, vaccination, and horns tipped. After processing, calves were assigned (4 pens/treatment) to the following treatments: 1) diets were top-dressed daily with 0.45 kg of corn containing 22 mg/kg of BW of chlortetracycline for the first 5 d then 70 mg for the following 51 d with up to four re-pulls for BRD therapy (HighCTC), 2) 70 mg of chlortetracycline with up to three re-pulls for BRD therapy (LowCTC) for 56 d, and 3) no chlortetracycline with one re-pulls for BRD therapy (NoCTC). Calves were program fed a 70% concentrate diet (corn based) for a prescribed gain of 1.1 kg/d for the 56 d trial; during the initial 5 d of the study steers were also fed 2.3 kg daily of bermudagrass hay/steer. Steers were re-weighed on d 14, 28, and 56. Data were analyzed by ANOVA and least-square means were separated using contrast for NoCTC vs HighCTC and LowCTC, and HighCTC vs LowCTC. Calf BW on d 0, 14,

28, and 56 did not differ ( $P > 0.35$ ) among treatments. The ADG from d 0 to 14 tended ( $P = 0.08$ ) to be greater for cattle fed HighCTC and LowCTC (0.86 kg/d) than for cattle fed NoCTC (0.43 kg/d); however, ADG did not differ ( $P > 0.15$ ) among treatments between d 0 to 56 (average = 0.87 kg/d). The percentage of calves treated for BRD once did not differ ( $P > 0.59$ ) among treatment (79%, NoCTC; 71%, LowCTC; 69% HighCTC); also, there was not differ ( $P > 0.26$ ) in the percentage of calves treated for BRD a second (26%) or third (3%) time. The number of days until first BRD treatment tended to be greater ( $P = 0.09$ ) for calves receiving NoCTC (9 d) than for those getting LowCTC and HighCTC (4 d). With locally purchased cattle, the use of NoCTC seemed as beneficial as the use of HighCTC and LowCTC.

**Key Words:** Antibiotics, Cattle, Feeding

## Small Ruminant Production

### 106 Genetic evaluation opportunities for small ruminants. D. R. Notter\*, Virginia Polytechnic Institute & State University.

Interest in, and opportunities for, the application of genetic evaluation methodology in small ruminants are expanding rapidly. The U.S. National Sheep Improvement Program (NSIP) currently provides across-flock genetic evaluations for growth, maternal ability, prolificacy, and fleece characteristics for seven sheep breeds (Targhee, Suffolk, Polypay, Columbia, Dorset, Katahdin, and Rambouillet). For 2002, NSIP processed performance records on a total of 9,843 lambs produced by 5,653 breeding ewes in 91 flocks. Estimates of genetic trends in performance since 1986 in Targhee sheep demonstrate significant increases in weaning and yearling weights, maternal ability, and prolificacy and significant reductions in fiber diameter. In both Suffolks and Polypays, EPDs for 60-d weaning weight, 120-d postweaning weight, and maternal ability have increased significantly since 1990, but little change has been observed in prolificacy. Several projects are currently under way to expand NSIP services to other traits and other species. A genetic evaluation of staple length was recently incorporated into the Targhee and Columbia evaluation systems. In the Targhee breed, data from an optical fiber diameter assessment (OFDA) system has been used to obtain advanced measurements of wool quality which can be incorporated into future Targhee genetic evaluations, and selection indexes for Targhee sheep have been derived. In the Katahdin breed, a pilot study to support development of a fecal egg count expected progeny difference (EPD) was begun in summer 2003 to identify genetic differences in resistance to internal parasites and will continue in 2004. A genetic evaluation system for growth and prolificacy in Boer Goats is scheduled for implementation in 2004, and a system for genetic evaluation of fiber production and quality in alpaca is under study. Additional high-priority areas for future development include the genetic evaluation of performance in accelerated lambing systems in Polypay sheep and the incorporation of ultrasonic measure of carcass merit into genetic evaluation systems for meat sheep and goats.

**Key Words:** Sheep, Genetic Evaluation, Performance Recording

### 107 Growth and parasite resistance of pasture-raised Dorper-, Texel-, and Suffolk-sired Katahdin crossbred lambs. D. J. Jackson<sup>1</sup>, N. C. Whitley<sup>1</sup>, J. W. Lemaster<sup>2</sup>, C. M. Fletcher<sup>1</sup>, and S. Schoenian<sup>2</sup>, <sup>1</sup>University of Maryland Eastern Shore, <sup>2</sup>Maryland Cooperative Extension.

The objective of the study was to compare growth performance and parasite resistance in Katahdin lambs sired by three different ram breeds and raised on pasture. In the Fall, 53 ewes were mated to a White Dorper (n=20), Texel (n=16), or Suffolk (n=17) ram. Lamb body weights were measured at birth (=d 0), d 33 ± 0.8, 51 ± 0.8, 75 ± 0.8 and 96 ± 0.8 (adjusted; d 30, 50, 70 and 90, respectively) and at post-weaning d 123.8 ± 0.7, 145.8 ± 0.7 and 158.8 ± 0.7 (adjusted; d 120, 140 and 160, respectively). Fecal samples for fecal egg count (FEC) determination were collected at d 70, 90, 120 and 140 and anthelmintic was administered only when FEC were 500 eggs per gram (epg) or greater in individual animals, with all lambs being treated at weaning (d 90). There was no influence of sire breed on number of lambs born per ewe lambing (1.8 ± 0.1), birth weight (3.8 ± 0.1 kg), or body weights at d

30 (11.8 ± 0.3 kg). However, by d 50 Suffolk-sired lambs were heavier ( $P < 0.03$ ) than Texel- and Dorper-sired lambs (20.19 ± 0.5, 18.36 ± 0.4 and 18.6 ± 0.5 kg at d 50, respectively; 30.3 ± 0.6, 26.8 ± 0.4 and 27.8 ± 0.5 kg at d 70, respectively; 33 ± 0.6, 30.3 ± 0.4 and 30.8 ± 0.5 kg at d 90, respectively; 39.7 ± 0.6, 36.0 ± 0.4, and 36.8 ± 0.5 kg at d 120, respectively; 43.5 ± 0.6, 38.9 ± 0.4, and 39.6 ± 0.5 kg at d 140, respectively and 48.9 ± 0.6, 42.8 ± 0.4 and 43.7 ± 0.5 kg at d 160, respectively). Average daily gain (ADG) was influenced by sire breed ( $P < 0.02$ ), with Texel-sired lambs exhibiting lower ADG (0.19 ± 0.01 kg d<sup>-1</sup>) than Suffolk-sired lambs (0.21 ± 0.01 kg d<sup>-1</sup>) while Dorper-sired lambs were intermediate (0.18 ± 0.01 kg d<sup>-1</sup>). There was no influence of sire breed on fecal egg counts, which averaged 136 ± 56, 1005 ± 62, 26 ± 59 and 278 ± 53 eggs per gram on d 70, 90, 120 and 140, respectively. Overall, in this study, Suffolk-sired Katahdin lambs raised on pasture had better growth performance and similar fecal parasite egg counts compared to White Dorper- and Texel-sired Katahdin lambs.

**Key Words:** Sustainable, Parasite, Crossbred Lambs

### 108 Production traits of St. Croix White and Dorper X St. Croix White lambs grazing native pasture during the dry season in the US Virgin Islands. R.W. Godfrey\*, A.J. Weis, and R.E. Dodson, University of the Virgin Islands, Agricultural Experiment Station.

St. Croix White (STX; n = 15) and Dorper X STX (DRP; n = 16) ewe and wether lambs were used to evaluate the growth of lambs grazing during the dry season under tropical conditions. Two wk after weaning at 63 d of age lambs were placed in guinea grass pastures (0.5 ha) in a rotational grazing system. Each week lamb weight, fecal egg counts (FEC) and packed cell volume (PCV) was collected for each lamb. Lambs were slaughtered at a BW of 30 kg. Carcass weight, fat thickness over the 12th rib, rib eye area (REA), percentage kidney-pelvic-heart (KPH) fat and leg circumference were measured. Data were analyzed by SAS procedures. Total rainfall was 583.4 mm, forage availability was 432.5 ± 64.6 kg dry matter/ha with 11.7 ± 0.9 % crude protein and grazing duration was 11.9 ± 2.1 d/pasture. Days on pasture was lower ( $P < 0.01$ ) for DRP than for STX lambs (172.1 ± 8.3 vs 205.5 ± 8.7 d, respectively). Average daily gain was higher ( $P < 0.03$ ) for DRP than for STX lambs (94.8 ± 2.4 vs 86.3 ± 2.5 g/d, respectively). There was no difference ( $P > 0.10$ ) between DRP and STX lambs in FEC or PCV during the grazing period. Cold carcass weight was not different ( $P > 0.10$ ) between DRP and STX lambs (13.0 ± 0.2 vs 13.0 ± 0.2 kg, respectively). The REA of DRP lambs was greater ( $P < 0.001$ ) than that of STX lambs (9.4 ± 0.2 vs 8.2 ± 0.2 cm<sup>2</sup>, respectively). Fat thickness was greater ( $P < 0.05$ ) in DRP than in STX lambs (2.1 ± 0.2 vs 1.7 ± 0.1 mm, respectively). Percentage KPH was not different ( $P < 0.10$ ) between DRP and STX lambs (3.6 ± 0.3 vs 2.2 ± 0.3 %, respectively). Leg circumference was not different ( $P > 0.10$ ) between DRP and STX lambs (38.9 ± 0.4 vs 38.3 ± 0.4 cm, respectively). Net revenue for carcass sales was not different ( $P > 0.10$ ) between DRP and STX lambs (\$57.38 ± 0.71 vs \$57.42 ± 0.74, respectively). These data indicate that DRP lambs will reach market weight sooner than STX lambs and do not exhibit higher levels of gastrointestinal parasites during the dry season in the US Virgin Islands.

**Key Words:** Sheep, Grazing, Crossbred

**109 Evaluation of Boer and Kiko goats for doe-kid performance to weaning.** R. Browning, Jr.\*, S. H. Kebe, and M. Byars, *Tennessee State University*.

Boer (n = 30) and Kiko (n = 27) yearling does and doelings were exposed to Spanish bucks in mixed breed, single-sire breeding groups in the fall of 2002 to evaluate doe and kid performance. Each doe was purebred or fullblood (93.75 to 100%). Each breed of doe was represented by at least six seedstock farms and eight sires. At kidding, 25 Boer and 23 Kiko does produced at least one live kid. Boer dams at kidding were heavier ( $P = 0.06$ ) than Kiko dams ( $48.49 \pm 1.25$  vs  $45.04 \pm 1.32$  kg). Litter size and litter weight at birth did not differ ( $P > 0.5$ ) between Boer ( $1.92 \pm 0.12$  kids,  $6.05 \pm 0.31$  kg) and Kiko dams ( $1.82 \pm 0.12$  kids,  $5.90 \pm 0.33$  kg). Kid birth weights were similar ( $P = 0.4$ ) between 48 Boer and 42 Kiko F<sub>1</sub> kids ( $3.21 \pm 0.09$  vs  $3.30 \pm 0.08$  kg). Litter size and sex of kid affected ( $P < 0.01$ ) birth weights. Each litter type differed ( $P < 0.001$ ) for kid birth weights (singles =  $3.84 \pm 0.14$ , twins =  $3.24 \pm 0.06$ , triplets =  $2.67 \pm 0.13$  kg). Bucklings at birth were heavier than doelings ( $3.39 \pm 0.08$  vs  $3.11 \pm 0.09$  kg). Bucklings were not castrated before weaning. Twenty Boer and 21 Kiko dams reared at least one kid to weaning at 14 wk of age. Boer and Kiko dam body weights at weaning did not differ ( $P = 0.35$ ;  $42.42$  vs  $40.75 \pm 1.25$  kg). Litter size at weaning was lower ( $P = 0.05$ ) and litter weaning weight was lower ( $P = 0.02$ ) for Boer ( $1.58 \pm 0.09$  kids,  $26.48 \pm 1.51$  kg) than for Kiko dams ( $1.85 \pm 0.09$  kids,  $31.73 \pm 1.52$  kg). The ratio of litter weight weaned to doe weight at weaning was greater ( $P = 0.01$ ) for Kiko compared to Boer dams ( $78.1$  vs  $63.9 \pm 4\%$ ). Preweaning ADG and weaning weights were greater ( $P < 0.05$ ) for 38 Kiko F<sub>1</sub> kids ( $141.3 \pm 4.63$  g/d,  $16.90 \pm 0.50$  kg) compared to 32 Boer F<sub>1</sub> kids ( $127.3 \pm 6.61$  g/d,  $15.36 \pm 0.71$  kg). Bucklings had higher ( $P < 0.01$ ) preweaning ADG and weaning weights ( $146.2 \pm 4.8$  g/d,  $17.39 \pm 0.51$  kg) than doelings ( $122.5 \pm 6.2$  g/d,  $14.88 \pm 0.67$  kg). Kiko does tended ( $P = 0.10$ ) to wean a higher kid crop percent and more ( $P = 0.07$ ) litter weight per doe exposed ( $125 \pm 19\%$ ,  $21.55 \pm 3.05$  kg) compared to Boer ( $86 \pm 19\%$ ,  $14.77 \pm 2.96$  kg). Results suggest that meat goat breeds differ for doe-kid performance under southeastern US conditions.

**Key Words:** Meat Goats, Breeds, Reproduction

**110 Genotype  $\times$  environmental interactions in goats.** N. C. Beckford\*, J. M. Dzakuma, E. Risch, and L. C. Nuti, *Prairie View A&M University*.

This study compared the performance of Boer (BR) Spanish (SP) and Tennessee Stiff-legged (TS) breeds of goats under intensive and pasture management systems. In the intensive system goats were penned in individual crates and fed varying levels (100% or ad libitum, 85% and 70% of the previous weeks ad lib averages) of an 18% CP and 65% TDN diet. Amount of feed given was weighed daily and orts, feces and urine were collected and weighed. Biweekly weights were taken on all goats. A second group of 72 kids, of the same breeds and same age, was raised with their dams on pasture. Before kids were weaned at an average age of 70 d, they were supplemented with a formulated ration containing approximately, 16% CP and 72% TDN. One-half the population of kids raised in individual stalls (intensively) and all goats raised on pasture were slaughtered at approximately six months of age. The other half of the intensively raised goats was slaughtered at yearling age. Birth weight of the TS was lower ( $P < .05$ ) than for BR and SP (2.9, 3.5 and 3.4 kg) respectively. Weaning weight for kids in the intensive rearing system differed ( $P < .05$ ) for BR (19.8 kg), SP (10.5 kg) and TS (14.3 kg) and again differed ( $P < .05$ ) in the pasture rearing system for BR (17.0 kg), SP (14.0 kg) and TS (11.2 kg). There was an interaction between management system and breed of goats ( $P < .05$ ) in that the SP gained less weight in the intensively reared system than the TS ( $P < .05$ ) which gained less weight than the BR ( $P < .05$ ), whereas weaning weight for pasture rearing system were 17.0, 14.0, 11.2 kg for BR, SP, and TS, respectively. Weaning weight of BR and TS kids raised intensively were significantly heavier than for those on pasture in contrast for the SP breed where pasture raised kids were heavier than intensively raised kids. A similar pattern was observed at 6 mo slaughter weight. The BR and TS breeds appear to be better adapted to intensive rearing conditions whereas the SP breed is better adapted to pasture rearing conditions, based on weaning and 6 mo slaughter weights, even though breed differences were smaller in the pasture management system.

**Key Words:** Boer, Spanish, Tennessee Stiff-legged

**111 Genetic and environmental effects on phenotypic expression of myotonia in the Myotonic goat.** B. L. Sayre\*, S. Wildeus, M. Dismann, and J. R. Collins, *Virginia State University*.

The Myotonic goat has congenital myotonia caused by a single nucleotide polymorphism (SNP) in the chloride channel-1 (ClC-1) gene, which is associated with the phenotypic expression of myotonia. Observations of Myotonic goats suggest that the phenotypic response may be variable among individuals. The objective of this experiment was to identify environmental and genetic effects on the phenotypic response. Phenotype was determined in Myotonic does (n=37) as (1) the duration of muscle knots after a sharp strike with a percussion hammer (PH), (2) duration of myotonia (MD), and (3) severity of myotonia (Scored on a scale of 1-9; MS). These tests were repeated in each doe for three weeks. All does were genotyped for a SNP in ClC-1. Data were analyzed for differences among genotypes, and within the myotonic genotype, the analyses were performed on ranked, untransformed and transformed data. There were no differences between normal and heterozygous genotypes for MD or MS, but PH differed ( $P < 0.01$ ) among genotypes. The myotonic genotype had greater ( $P < 0.01$ ) MD (2.8, 0.1, 0.1 sec), MS (4.8, 1.2, 1.1), and PH (3.6, 1.5, 0.5 sec) than heterozygous and normal genotypes, respectively. Within the myotonic genotype, phenotypic responses differed ( $P < 0.05$ ) with week of testing (MD: 3.6, 3.2, 2.2 sec; MS: 4.9, 5.2, 4.4; PH: 3.9, 3.3, 3.4 sec, for week 1, 2, 3, respectively). In addition, interactions of individuals within week differed ( $P < 0.05$ ) among phenotypic tests. When the data were transformed to account for differences among weeks, phenotypic responses differed ( $P < 0.05$ ) for the MS and PH tests, but not the MD test. Myotonic goats homozygous for a SNP in the ClC-1 gene exhibited classic phenotypic responses for myotonia. The variability of phenotypic responses among weeks of testing indicated that the differences observed were related to environmental conditions. However, when the data were transformed to remove those effects, differences remained in the response among individuals with the same genotype, which indicated there is also a genetic component.

**Key Words:** Goat, Myotonia, Genetics

**112 Differences in performance of hair sheep lambs and meat goat kids offered high forage diets with a corn-based supplement.** S. Wildeus\*<sup>1</sup>, K. E. Turner<sup>2</sup>, S. P. Greiner<sup>3</sup>, and J. R. Collins<sup>1</sup>, <sup>1</sup>Virginia State University, Petersburg, <sup>2</sup>USDA, ARS, Appalachian Farming Systems Research Center, Beaver, WV, <sup>3</sup>Virginia Tech, Blacksburg.

Hair sheep and meat goats are suited for similar production environments and generally are sold to ethnic niche markets. However, there is only limited information directly comparing the performance of these two species in the U.S. For this experiment 36 intact males (equally representing Barbados Blackbelly, Katahdin, and St. Croix hair sheep, and Boer-cross, Myotonic, and Spanish meat goats) were allocated at 3.5 mo of age to 6 pens by species (3 pens/species) with pens balanced for breed. Animals were offered a moderate quality tall fescue (*Festuca arundinacea* Schreb.) hay (10.6% CP, 46.9% IVOMD, 70.4% NDF, 39.5% ADF) *ad libitum*, and limit-fed a corn-whole cottonseed-soybean meal supplement (15.5% CP) at 2.0% BW during the 163-d trial. Intake (pen basis) of hay and supplement, was recorded on d 28, 84, and 154 of the trial in 5 d collection periods. At the beginning of each intake period, blood samples were collected via jugular venipuncture to determine plasma metabolites. On d 156, ultrasonic estimates of fat thickness over the longissimus and longissimus area measurements were made and animals graded. Data were analyzed for the effects of species. Forage DM intake was higher in sheep than goats (1.49 vs. 1.36 % BW;  $P < .05$ ), and decreased ( $P < .01$ ) overall from 1.66% BW to 1.26% BW during the course of the trial. Sheep had higher ( $P < .001$ ) starting BW (21.7 vs 16.6 kg), final BW (45.3 vs 33.5 kg) and ADG (145 vs 107 g/d). Sheep also graded higher ( $P < .01$ ), and had a greater ( $P < .001$ ) fat thickness (0.42 vs 0.18 cm) and longissimus area (11.4 vs 8.6 sqcm). Sheep had higher ( $P < .01$ ) blood urea nitrogen (20.6 vs. 16.6 mg/dL), glucose (75.1 vs. 67.5 mg/dL), and creatinine (0.619 vs. 0.542 mg/dL) concentrations compared to goats. Results indicate that hair sheep lambs grew faster and consumed more forage than meat-type goats under the conditions of this experiment.

**Key Words:** Hair Sheep, Meat Goats, Performance

**113 Use of ceramic rumen boluses of different sizes for electronic identification of hair sheep lambs.** S. Wildeus\*<sup>1</sup>, J. R. Collins<sup>1</sup>, and S. K. Duckett<sup>2</sup>, <sup>1</sup>Virginia State University, Petersburg, <sup>2</sup>University of Georgia, Athens.

To control disease transmission and trace progression from farm to table for agricultural products there is a need for improved, long-term means of animal identification. In recent years electronic (microchip) identification of animals has received increased attention. In ruminant animals providing the electronic identification by means of a rumen bolus is a possible means of application. This experiment evaluated application time, retention, and site of deposition of commercial (Rumitag; Gesimpex, Barcelona, Spain) ceramic rumen boluses of three sizes (small: 38 mm length x 9 mm diameter, 9.0 g; medium: 42 mm length x 12 mm diameter, 16.1 g; large: 68 mm length x 21 mm diameter, 76.8 g) in hair sheep lambs. Lambs (n=72), equally representing the Barbados Blackbelly, Katahdin, and St. Croix breeds, and ewe and wether lambs, were allocated to pasture and pen groups. At 6 mo of age animals were implanted with one of the 3 bolus types and implanting and coding time (validation of presence of bolus and assigning of animal ID) was recorded. Functional integrity of each bolus was recorded via data logger in 14-d intervals. After 3.5 mo, presence and location of boluses within the gastrointestinal tract were determined at slaughter in the wether lambs (n=36). The effects of bolus size were analyzed by chi-square and analysis of variance. Implant time was shorter ( $P < .05$ ) for small (14.9 sec) than large boluses (19.8 sec), with medium boluses intermediate (16.7 sec). Coding time averaged 44.6 sec and was not affected ( $P > .05$ ) by bolus type. All boluses were retained during the testing period and provided a consistent signal to the data logger. At slaughter 45.7% of boluses were recovered from the reticulum and 54.3% from the rumen, while one medium bolus was not recovered. There was no effect of bolus type on site of deposition in the gastrointestinal tract. Data suggest that transponders encased in ceramic boluses can be an effective means of providing electronic identification for lambs.

**Key Words:** Electronic ID, Rumen Bolus, Hair Sheep

**114 Forecasting models developed from West Virginia lamb sale transactions provide evidence of seasonality of slaughter and feeder lamb prices and a shifting market preference.** D. Singh-Knights\*, D. Smith, and M. Knights, West Virginia University.

Understanding of the factors affecting local and regional variations in prices and number of lambs sold may be useful in improving marketing inefficiencies as producers have greater control over these factors than over general market conditions. Lamb sales transactions from auction markets in WV for the period 1994-2001 were analyzed to determine the effects of year, month, location, lamb class (feeder or slaughter) and their interactions on lamb price and lamb sales. Forecasting procedures (SAS/ETS 8.0) were used on the lamb price and lamb sales series to construct lamb price and supply models and to develop forecasts for 2002-2005. The number of lambs sold and prices received was significantly affected by category, month and year ( $P < 0.01$ ). More slaughter lambs were sold compared to feeder lambs ( $P < 0.01$ ) during each year of the survey and in most months except April (category X month  $P < 0.05$ ). Peaks in lamb sales during the late summer and fall months were associated with the lowest lamb prices; conversely, declining lamb sales during winter and spring months were associated with the highest lamb prices. Mean prices over the period was higher for feeder than slaughter lambs ( $P < 0.01$ ). A significant year X category interaction ( $P < 0.01$ ) for prices received was observed suggestive of structural change in market demand towards a lighter lamb after 1997. A log seasonal exponential smoothing model fitted the slaughter lamb price and sales, and feeder lamb price series best. Both seasonality and a declining trend were detected in the feeder lamb sale series. This series was best modeled by the Winters Multiplicative method. The results of the price forecast suggest a continued seasonal pattern for WV slaughter and feeder lamb prices. The sales forecast suggests a continued seasonal pattern in WV slaughter lamb sales but predicts a declining trend in feeder lamb sales. A growing market preference for a lighter (leaner) lamb as reflected in higher market prices for feeder lambs was also observed. However, the predicted declining trend in supply of feeder lambs suggest a failure of producers to receive these price signals, or to understand the potential profitability associated with matching product offering to market preferences.

**Key Words:** Lamb Price, Seasonality, Forecast

**115 The effect of Quebracho tannin supplementation on growth and parasitism in young goats and hair sheep grazing parasite-infected pasture.** S. Wildeus\*<sup>1</sup>, A. M. Zajac<sup>2</sup>, K. E. Turner<sup>3</sup>, and J. R. Collins<sup>1</sup>, <sup>1</sup>Virginia State University, Petersburg, <sup>2</sup>Virginia Tech, Blacksburg, <sup>3</sup>USDA, ARS, Appalachian Farming Systems Research Center, Beaver, WV.

There is an increasing need to identify alternatives to commercial anthelmintics for use in integrated parasite control programs. Condensed tannins have been associated with anthelmintic activity in some studies, but an earlier experiment in our lab suggested that Quebracho condensed tannin (QT) fed at 2.5% DM intake had no effect on fecal egg counts (FEC) in weaned goats experimentally infected with *Haemonchus contortus* larvae. This experiment evaluated acceptability of a 5% DM QT intake in goats and sheep, and its effect on gastrointestinal parasitism when grazing naturally infected pasture. Crossbred female goat kids (n=16) and hair sheep lambs (n=32) were allocated to a control and treatment group by species, and placed on a native grass pasture (1.6 ha) divided into two units. Each group received a daily supplement of cracked corn/soybean meal/molasses (17% CP) containing either 0% (fed at 1% BW) or 18% Quebracho tannin (fed at 1.22% BW). Body weights, FEC, packed blood cell volume (PCV), and preprandial plasma blood urea nitrogen (BUN), creatinine, and glucose levels were recorded at 14-d intervals for 56 d. Data were analyzed for effects of QT and species on BW change, FEC (after log conversion), PCV, and blood metabolites. There was no effect of QT ( $P > .05$ ) on BW, FEC, and PCV, but BUN was lower (18.2 vs. 19.01 mg/dL;  $P < .01$ ), and creatinine higher (0.61 vs. 0.57 mg/dL;  $P < .001$ ) in QT than control animals. Sheep maintained a higher PCV (29.6 vs. 25.0%;  $P < .001$ ) and lower FEC (613 vs. 1062 eggs/g;  $P < .001$ ) than goats. There was incomplete consumption of the QT supplement towards the end of the experiment, and necropsy of two lambs from each treatment group suggested a mucosal thickening of the colon in QT animals. Results indicate that a commercial form of condensed tannin fed at 5% of DM intake had no effect on gastrointestinal parasitism.

**Key Words:** Small Ruminants, Parasites, Tannin

**116 Effect of copper oxide needles on gastrointestinal parasites in grazing meat goats.** H. M. Glennon\*<sup>1</sup>, J-M. Luginbuhl<sup>1</sup>, J. P. Mueller<sup>1</sup>, A. M. Zajac<sup>2</sup>, K. L. Anderson<sup>1</sup>, J. W. Spears<sup>1</sup>, T. T. Brown<sup>1</sup>, and C. Brownie<sup>1</sup>, <sup>1</sup>North Carolina State University, <sup>2</sup>Virginia-Maryland Regional College of Veterinary Medicine.

Two trials were conducted to evaluate the effects of copper (Cu) oxide needles (CuON) on trichostrongylid parasites in grazing Boer-cross yearling goats. In trial 1, 18 does and 18 wethers (40 kg BW) were stratified by fecal egg counts (FEC) and sex, and sorted into 6 groups of 6 animals in a randomized complete block design (RCBD) with 3 replications. On d 0, control (CTL) goats received a combined dose of Panacur (10 mg/kg BW) and Levamisole (11 mg/kg BW) whereas treated goats received a 5 g CuON bolus. In trial 2, 45 wethers (48 kg BW) were stratified by FEC and randomly assigned to 1 of 9 groups of 5 animals each in a RCBD with 3 replications. Treatments were 0 (CTL), 5 g, or 10 g of a CuON bolus. In both trials, goats were rotationally grazed in separate bermudagrass/crabgrass plots. Fecal and blood samples were taken every 7 d. Liver samples and the abomasum (trial 2 only) were taken when animals were sacrificed on d 74 (trial 1) and d 59 & 60 (trial 2). In trial 1, FEC were lower ( $P < .06$ ) for CuON goats on d 31 (2,426 vs 4,115 eggs/g feces). Liver Cu concentrations were higher ( $P < .08$ ) in CuON goats (395 vs 151 mg/kg DM). Liver lesions, packed cell volume (PCV), total protein (TP) and plasma Cu concentrations did not differ. In trial 2, FEC were higher ( $P < .05$ ) in CTL than 10g CuON goats on d 14 (CTL: 4117; 5 g: 2795; 10 g: 1768 eggs/g feces). Goats on 10 g CuON had lower ( $P < .05$ ) PCV on d 14 (CTL: 31.3; 5 g: 32.4; 10 g: 29.1%). Liver Cu concentrations were lower ( $P < .05$ ) in CTL than in 5 g or 10 g CuON goats (CTL: 92; 5 g: 296; 10 g: 381 mg/kg DM). Total protein, plasma Cu concentrations, liver lesions and number of *H. contortus* or *T. axei* found in the abomasum were similar. Although CuON have the potential to become part of an integrated internal parasite program, additional research is needed before CuON can be recommended as a safe and effective anthelmintic.

**Key Words:** Gastrointestinal Parasites, Goats, Copper Oxide Needles

**117 Dose of copper oxide wire particles (COWP) and feed supplement level influences *Haemonchus contortus* infection in lambs.** J. M. Burke\*<sup>1</sup> and J. E. Miller<sup>2</sup>, <sup>1</sup>USDA, ARS, <sup>2</sup>School of Veterinary Medicine, Louisiana State University.

The objective of the experiment was to determine the optimal dose of COWP to reduce infection of *H. contortus* in male lambs receiving a low or moderate level of supplement. Five to 6 months old hair breed lambs were housed on concrete, fed 454 (L) or 680 g (M; n = 25/supplement) corn/SBM with free choice access to bermudagrass hay, trace mineral and water. On Day 0, lambs were inoculated with 10,000 L<sub>3</sub> larvae (97% *H. contortus*). Blood and feces were collected every 7 d for packed cell volume (PCV) and fecal egg counts (FEC) between Day 0 and day of slaughter on Day 54 (n = 25) or 63 (n = 24). Lambs were administered 0, 2, 4, or 6 g COWP on Day 28. Concentrations of copper in the liver were determined. One of the control lambs died on Day 37, likely from haemonchosis. There were no effects of supplement level on copper in the liver. Liver concentrations of copper of the 0, 2, 4, 6 g COWP treatments were 62.2, 135.7, 161.1, and 208.4 ± 13.8 ppm ( $P < 0.001$ ). Between Days 0 and 28, PCV declined in all lambs and by Day 42, PCV of all COWP treated lambs was greater than control lambs and remained higher (COWP × day,  $P < 0.05$ ). By Day 21, PCV was greater in the M compared with the L group of lambs ( $P < 0.001$ ) and, with the exception of Day 42, remained higher in these lambs (supplement × day,  $P < 0.001$ ). The increase in FEC in response to inoculation was observed by Day 21. Within 7 days of COWP treatment, FEC declined from more than 8,000 eggs/g (epg) to less than 1,000 epg in all COWP treated lambs (COWP × day,  $P < 0.001$ ). FEC were similar between the 4 and 6 g COWP lambs at all times, but FEC were greater on Day 35 in the 2 g (830 epg) vs. 4 and 6 g (75, 72 epg) COWP group ( $P < 0.02$ ). FEC were greater in L vs. M supplemented lambs and values decreased to a greater extent in M lambs when treated with COWP (supplement × COWP;  $P < 0.02$ ). The 2 g COWP was effective in alleviating *H. contortus* infection with the lowest concentration of copper in the liver of the COWP treatment groups. PCV values were more favorable for lambs fed the higher level of supplement, especially when FEC were greater than 8,000 epg.

**Key Words:** Copper Oxide, *Haemonchus Contortus*, Lambs

**118 Nutrient requirements of goats: Web-based calculator.** A. L. Goetsch\*, T. A. Gipson, T. Sahl, and R. C. Merkel, *E (Kika) de la Garza American Institute for Goat Research, Langston University, Langston, OK.*

In order for nutrient requirement expressions to be of value, they must be readily accessible to potential users and reasonably simple considering audience diversity. Therefore, a web-based goat nutrient requirement calculation system was developed from findings of a recent project based on a database of treatment mean observations from the literature. JavaScript, a powerful client-side scripting language, was used for all calculators. There are calculators for requirements of metabolizable energy for suckling, growing, mature, lactating, and Angora goats and gestation, and of metabolizable protein for growing, mature, lactating, and Angora goats and gestation. Metabolizable energy requirements can be adjusted for factors such as grazing activity energy cost, acclimatization, and previous nutritional plane. Dietary dry matter necessary to meet metabolizable energy needs for growing, mature, and Angora goats are adjusted for influences of dietary metabolizable energy concentration on efficiencies of metabolism. Feed intake can be predicted for lactating, Angora, mature, and growing goats. The web site includes a tool to determine amounts and composition of supplemental concentrate appropriate for particular forages. Also, there is a spread sheet-like application for total mixed rations based on the language PERL, due to its flexibility in database parsing and integration into html, as well as JavaScript. In conclusion, this web-based goat nutrient requirement calculation system should enjoy widespread usage and enhance feeding practices.

**Key Words:** Goats, Nutrient Requirements, Internet

**119 Metabolizable protein requirements for maintenance and gain of growing goats.** J. Luo<sup>1</sup>, A. L. Goetsch\*<sup>1</sup>, I. V. Nsahlai<sup>2</sup>, and T. Sahl<sup>1</sup>, <sup>1</sup>*E (Kika) de la Garza American Institute for Goat Research, Langston University, Langston, OK,* <sup>2</sup>*Department of Animal and Poultry Science, University of Natal, Scottsville, R. South Africa.*

A database of 349 treatment mean observations, representing 3,404 goats from 73 publications, was used to determine metabolizable protein (MP) requirements for maintenance (MP<sub>m</sub>) and growth (MP<sub>g</sub>) of goats. Published CP degradation properties of feedstuffs and proportions of dietary ingredients were used to estimate MP intake (MPI, g/d), which was regressed against ADG. Goats were classified as meat ( $\geq 50\%$  Boer; 60 observations), dairy (selected for milk production; 129 observations), and indigenous (160 observations) biotypes. Because of differences ( $P < 0.01$ ) among biotypes in slopes, separate regressions were initially performed: meat: MPI = 2.55 (SE = 0.360) + (0.441 (SE = 0.0276) × ADG) (n = 58; R<sup>2</sup> = 0.82); dairy: MPI = 2.83 (SE = 0.344) + (0.299 (SE = 0.0238) × ADG) (n = 123; R<sup>2</sup> = 0.57); and indigenous: MPI = 3.23 (SE = 0.212) + (0.281 (SE = 0.0304) × ADG) (n = 152; R<sup>2</sup> = 0.36). Intercepts did not differ among biotypes ( $P = 0.37$ ), but the slope for meat goats differed ( $P < 0.01$ ) from those for dairy and indigenous goats; therefore, data sets for dairy and indigenous goats were pooled and split into development (n = 150) and evaluation (n = 125) subsets. Using the equation derived from the development data subset for dairy and indigenous goats (i.e., MPI = 3.14 (SE = 0.189) + (0.285 (SE = 0.0168) × ADG) [n = 144; R<sup>2</sup> = 0.67]), MPI for the evaluation subset was predicted; regressing observed against predicted MPI of the evaluation data subset resulted in an intercept and slope not different from 0 and 1, respectively ( $P > 0.05$ ). The equation from the development subset for dairy and indigenous goats was compared with the equation from the meat goat data set; there was a difference ( $P < 0.01$ ) in slopes but not in intercepts ( $P = 0.25$ ). Therefore, a dummy variable (D = 1 for meat goats and 0 otherwise) was used to develop a common intercept equation: MPI = 3.07 (SE = 0.165) + (0.290 (SE = 0.0150) × ADG) + (0.114 (SE = 0.0162) × D × ADG) (n = 202; R<sup>2</sup> = 0.75). In conclusion, based on regression of MPI against ADG, MP<sub>m</sub> was 3.07 g/kg BW<sup>0.75</sup> for all biotypes of growing goats, and MP<sub>g</sub> was 0.404 and 0.290 g/g ADG for meat and other (dairy and indigenous) goats, respectively.

**Key Words:** Goats, Metabolizable Protein

**120 Determination of nitrogen balance in goats fed the byproduct, secondary protein nutrients.** S. R. Freeman\*, M. H. Poore, and G. B. Huntington, *North Carolina State University.*

Secondary protein nutrients (SPN) is an ingredient produced from dissolved air floatation sludge from poultry processing plants. Replacement of up to 50% of soybean meal N (SBM) with SPN N resulted in similar growth in beef steers. Ruminal ammonia and blood urea N (BUN) however, showed linear declines with each SPN increase. To better characterize the utilization of the N in SPN, a trial was conducted utilizing 20 Boer-cross wether goats (average initial weight = 17.0 kg). The goats were fed one of four diets consisting of 50% fescue hay and 50% pellets (corn, SBM, SPN, minerals, molasses, and fat). A 15 d ad libitum feeding phase was followed by a 5 d total excreta collection. Crude protein of the complete diets were 9.70% (no added N: -con), 13.50% (all added N from SBM: +con), 13.91% (20% of added N from SPN: SPN20), and 13.62% (40% of added N from SPN: SPN40). The day after excreta collection ended, ruminal fluid was sampled 2h after feeding via rumenocentesis and blood samples were collected prior to feeding (0h) and 2, 4, and 8h after feeding. Preplanned contrasts were -con vs. N supplemented diets, and linear and quadratic effects of SPN substitution. Goats receiving -con had lower ( $P < .05$ ) DMI than goats receiving supplemental N (489, 631, 628, and 643 g/d for -con, +con, SPN20, and SPN40, respectively). There were no differences in DM or OM digestibility (70.5, 69.8, 69.8, and 69.6% DDM; 71.4, 70.6, 70.5, and 69.1% DOM for -con, +con, SPN20, and SPN40, respectively). Retention of N was lower ( $P < .05$ ) for the -con goats and there was a quadratic effect ( $P < .05$ ) among +con, SPN20, and SPN40 diets (1.75, 3.43, 4.90, and 3.58, respectively). Goats on -con had lower BUN ( $P < .05$ ) than supplemented goats (5.56, 7.82, 7.26, and 8.32 for -con, +con, SPN20, and SPN40, respectively). Preliminary data indicate that providing 20% of added N in the form of SPN improves N retention, possibly by synchronizing N and energy availability within the rumen or by supplying more essential amino acids posturally.

**Key Words:** Goats, N Retention, Byproduct Protein

**121 Effects of ruminally protected betaine and choline on net flux of nutrients across the portal-drained viscera and liver of meat goats consuming diets differing in protein concentration.** R. Puchala\*, V. Banskalieva, A. L. Goetsch, J. Luo, and T. Sahlu, *E (Kika) de la Garza American Institute for Goat Research, Langston University, Langston, OK.*

Six Boer × Spanish wethers ( $43 \pm 5.1$  kg BW) were used in an experiment with a  $2 \times 3$  factorial arrangement of treatments to investigate effects of dietary CP level (9 and 15% DM) and supplementation with ruminally protected betaine or choline (0.9% DM) on plasma concentrations and net flux of oxygen, ammonia N, non-esterified fatty acids (NEFA), triacylglycerols (TG) and cholesterol across the portal-drained viscera (PDV) and liver. Neither betaine nor choline affected blood flow, packed cell volume, hemoglobin concentration or oxygen consumption. Blood flow and oxygen consumption were greater ( $P < 0.05$ ) for 15 vs. 9% dietary CP. Arterial plasma ammonia N concentration was greater ( $P < 0.05$ ) for 9 vs. 15% CP. Compared with Control, choline supplementation decreased ( $P < 0.05$ ) PDV release and hepatic uptake of ammonia N with the 15% CP diet, whereas betaine decreased ( $P < 0.05$ ) PDV release and hepatic uptake of ammonia N with 9% dietary CP. With 9% dietary CP, the concentration of NEFA in arterial, hepatic venous and portal venous plasma ranked ( $P < 0.05$ ) choline < Control < betaine; with 15% CP, NEFA concentration also was greater ( $P < 0.05$ ) for betaine vs. Control, although the magnitude of difference was smaller than with 9% CP. The only treatment effect on NEFA net fluxes was greater ( $P < 0.05$ ) hepatic uptake with 9% CP than with 15%. Plasma triacylglycerol (TG) concentrations also were increased ( $P < 0.05$ ) by betaine with 9% dietary CP, whereas choline did not have influence with either dietary CP level. Concentrations and net fluxes of cholesterol were similar among treatments. In conclusion, these data indicate that potential effects of ruminally protected betaine on performance of ruminants might involve changes in lipid metabolism, with the magnitude of alteration varying with dietary CP level.

**Key Words:** Goats, Betaine, Choline

**122 Content and fatty acid composition of plasma lipids in lactating goats fed sunflower oil supplemented diet.** V. B. Banskalieva\*, V. L. Tzvetkova, and P. T. Marinova, *Institute of Animal Science.*

Beneficial effects of diets improving the PUFA:SFA ratio of body lipids are attracting increased research attention. The purpose of this study was to study the effect of sunflower oil on the level and fatty acid profile of plasma lipid fractions in lactating goats. The experiment was carried out with 3 groups of 7 lactating animals (at mid-lactation) each, of the local Bulgarian White goat type, at the Institute of Animals Science, Kostinbrod. The animals were fed for 21 days controlled iso-nitrogenous diets, containing either no added fat (control), or sunflower oil, added 2.5% and 5% (of wet weight of concentrate), respectively for the first and second experimental group. Sunflower oil supplemented diets increased ( $p < 0.05$ ) the level of the plasma free fatty acids (FFA), triacylglycerols (TG), phospholipids (PL) and cholesterol esters (ChE), more substantially ( $p < 0.01$ ) in animals fed of a higher amount of fat. The relative part of C16:0 decreased ( $p < 0.05$ ) in all lipid fractions of both experimental groups, accompanied with an elevation ( $p < 0.05$ ) of C18:0 in FFA and TG, but not in ChE in animals receiving 2.5% sunflower oil. The level of C18:1 did not change in TG, FFA but increased ( $p < 0.05$ ) in PL and ChE. The higher amount of added fat (5%) increased the percentage of C18:1 in FFA and TG ( $p < 0.05$ ), as well as the linoleic acid content in PL and ChE ( $p < 0.05$ ) with a concomitant reduction of C18:3 level ( $p < 0.01$ ), which changed the n-6/n-3 ratio in both lipid fractions. As a result of the observed variations of the relative parts of the individual fatty acids, the total unsaturation of FFA, TG, PL and ChE did not change when 2.5% sunflower oil was added, but it was increased using a doubled amount of supplemented fat. The changed plasma lipid profiles indicate that both diets, supplemented with different amounts of sunflower oil (rich in C18:2) influenced in a different way the lipid metabolism of the experimental animals, and hence an effect on the lipid profile of produced milk could be expected.

**Key Words:** Sunflower Oil, Plasma Lipids, Fatty Acids

**123 Mixed-species and grazing management effects on the performance of goats: Preliminary observations.** S. Gebrelul, A. Chappell, Y. Ghebreyessus, A. Harris\*, and M. Berhane, *Southern University Agricultural Research and Extension Center.*

A mixed-grazing project was designed to determine the performance of goats grazed alone or with cattle under a rotational or continuous grazing management system. In a  $2 \times 2$  factorial, 80 Spanish goats and 14 Brangus cows were randomly assigned to continuous or rotational grazing, and two grazing schemes (goats alone and goats mixed with cattle). A land area of approximately 20 ha on Bermuda grass was divided into four pastures, 8 ha each for mixed-species grazing and 2 ha each for goats-alone grazing. The rotational pastures were further divided, using electric fences, into four paddocks each to facilitate controlled grazing. Each paddock was grazed for seven days and allowed to rest for approximately 28 days. The pastures were reseeded with Bermuda seed in May 2003 and animals were assigned to their respective treatment groups in July 29, 2003. Animals were weighed every 28 days. Monthly and total gains, and average daily gains were obtained from the monthly weights. Data were analyzed using SASs GLM where grazing scheme, grazing type and interaction were included as fixed effects in the model. Goats in mixed-grazing gained more weight in August ( $2.0 \pm 0.2$  kg vs.  $0.9 \pm 0.2$  kg), September ( $2.4 \pm 0.3$  vs.  $0.7 \pm 0.3$  kg) and overall total gain ( $7.1 \pm 0.6$  vs.  $4.8 \pm 0.6$  kg) than goat grazing alone. Overall weight gains from July to September was higher ( $P < 0.05$ ) in goats in mixed-grazing under rotational grazing ( $8.7 \pm 0.8$  kg) followed by goats-alone in continuous grazing ( $7.0 \pm 0.8$  kg) and mixed-goats in rotational grazing ( $5.4 \pm 0.8$  kg). Goat-alone in rotational grazing gained the least ( $2.6 \pm 0.8$  kg). Similar trends were observed in average daily gains. Preliminary observations indicated that grazing cattle with goats improved rate of gain of goats as compared to goats grazing alone. More data is needed to characterize grazing types under the current scheme.

**Key Words:** Goats, Mixed Grazing, Rotational Grazing

**124 The effects of mixed-species and grazing management on the performance of Brangus cows: Early observations.** A. Chappell\*, S. Gebrelul, V. Bachireddy, O. Udoh, and G. Simon, *Southern University Agricultural Research and Extension Center.*

A long-term project was designed to determine the performance of Brangus cattle under different grazing management systems. In a  $2 \times 2$  factorial, 28 Brangus cows and 40 Spanish goats were randomly assigned to continuous or rotational grazing, and cows were allowed to graze alone or mixed with goats. A land area of approximately 27 ha on Bermuda grass was divided into four pastures, 8 ha each for mixed-species grazing and 5.5 ha each for cattle-alone grazing. The rotational pastures were further divided, using electric fences, into four paddocks each. Each paddock was grazed for fourteen days and allowed to rest for approximately 28 days. The pastures were reseeded with Bermuda seed in May 2003 and animals were assigned to their respective treatment groups in July, 2003. Animals were weighed every 28 days. Monthly and total gains, and average daily gains were obtained from the monthly weights. Data were analyzed using SASs GLM where grazing scheme, type and interaction were included as fixed effects in the model. There were no differences ( $P > 0.05$ ) in monthly weights due to grazing scheme, type or interaction. Monthly gains in cattle grazing alone was higher ( $27.9 \pm 2.5$  vs.  $17.2 \pm 2.8$  kg,  $P < 0.05$ ) than cattle grazing with goats in August but only numerically higher ( $P > 0.05$ ) in other months. Cattle in continuous grazing gained more during the summer than cattle in rotational grazing ( $52.0 \pm 5.5$  vs.  $26.4 \pm 5.3$  kg,  $P < 0.05$ ). Under continuous grazing, the total gains in cattle grazing alone and grazing with goats were similar ( $55.2 \pm 7.5$  vs.  $48.9 \pm 8.1$  kg) but were higher than cattle grazing alone or grazing with goats under rotational system ( $25.9 \pm 7.0$  vs.  $26.9 \pm 8.1$  kg). Similar results were observed in average daily gains. Preliminary observations indicated that cattle required more time to adjust and perform when mixed with goats. More information is needed to evaluate mixed grazing systems under Louisianan conditions.

**Key Words:** Brangus, Goats, Mixed Grazing

**125 Effects of stocking rate on grazing behavior of sheep and goats co-grazing mixed pastures.** G. Anicut\*<sup>1,2</sup>, A. L. Goetsch<sup>1</sup>, G. E. Aiken<sup>3</sup>, R. Puchala<sup>1</sup>, G. Detweiler<sup>1</sup>, C. R. Krehbiel<sup>2</sup>, R. C. Merkel<sup>1</sup>, T. Sahl<sup>1</sup>, L. J. Dawson<sup>4</sup>, and Z. B. Johnson<sup>5</sup>, <sup>1</sup>*E (Kika) de la Garza American Institute for Goat Research, Langston University, Langston, OK*, <sup>2</sup>*Animal Science Department, Oklahoma State University, Stillwater, OK*, <sup>3</sup>*USDA ARS Dale Bumpers Small Farms Research Center, Booneville, AR*, <sup>4</sup>*College of Veterinary Medicine, Oklahoma State University, Stillwater, OK*, <sup>5</sup>*Department of Animal Science, University of Arkansas, Fayetteville, AR*.

Effects of stocking rate (SR) on grazing behavior of growing sheep and goat wethers co-grazing mixed pastures were determined. Grazing was for 16-wk periods in 2002 and 2003. Pastures consisted of various grasses, such as bermudagrass (*Cynodon dactylon*) and johnsongrass (*Sorghum halepense*), and forbs (e.g., ragweed; *Ambrosia* spp). Sheep (Katahdin) and goats ( $\geq 75\%$  Boer) averaged  $21 \pm 4.8$  and  $21 \pm 3.7$  kg initial BW, respectively, and were 4 to 5 mo of age when grazing began. Stocking rates were four (4), six (6), and eight (8) animals per 0.4-ha pasture, with equal numbers of sheep and goats. The nine pastures (three/treatment) were divided into four paddocks, which were sequentially grazed in 2-wk periods. In wk 3, 8, and 13, behavioral observations were made on two goats and two sheep in each pasture every 30 min of daylight (i.e., 27 observations) for position (standing vs lying) and activity (grazing, ruminating, or idle). Observations were averaged over time of the day to determine percentages of total daylight. There were interactions ( $P < 0.05$ ) between year and the linear effect of SR in time spent grazing (yr1: 57.3, 57.8, and 62.3%; yr 2: 48.0, 56.4, and 60.5% (SE = 1.54)) and idle (yr 1: 18.7, 20.9, and 16.3%; yr 2: 29.7, 21.4, and 15.5% for 4, 6, and 8, respectively (SE = 1.95)). Standing time increased linearly ( $P < 0.05$ ) as SR increased (61.1, 66.3, and 69.8% for 4, 6, and 8, respectively). Grazing time was similar between species (56.1 and 58.0% for sheep and goats, respectively (SE = 0.97)), although idle time was greater ( $P < 0.05$ ) for goats vs sheep (23.6 vs 17.21%; SE = 1.36). Time ruminating was similar among SR but differed between species (25.0 and 17.0% for sheep and goats, respectively; SE = 1.22). Year and species interacted ( $P < 0.05$ ) in time standing (yr 1: 69.8 and 66.6%; yr 2: 60.2 and 66.3% (SE = 1.26)) and ruminating (22.3 and 19.0%; yr 2: 27.8 and 15.1% for sheep and goats, respectively (SE = 1.41)). In summary, these results suggest that influences of SR on grazing time and presumably energy expenditure may vary with grazing season. With forage conditions of this study, it appears that SR has similar effects on grazing behavior of sheep and goats when co-grazing.

**Key Words:** Goats, Co-grazing, Stocking Rate

**126 Effects of stocking rate on performance of sheep and goats co-grazing mixed pastures.** G. Anicut\*<sup>1,2</sup>, A. L. Goetsch<sup>1</sup>, G. E. Aiken<sup>3</sup>, R. Puchala<sup>1</sup>, G. Detweiler<sup>1</sup>, C. R. Krehbiel<sup>2</sup>, R. C. Merkel<sup>1</sup>, T. Sahl<sup>1</sup>, L. J. Dawson<sup>4</sup>, and Z. B. Johnson<sup>5</sup>, <sup>1</sup>*E (Kika) de la Garza American Institute for Goat Research, Langston University, Langston, OK*, <sup>2</sup>*Animal Science Department, Oklahoma State University, Stillwater, OK*, <sup>3</sup>*USDA ARS Dale Bumpers Small Farms Research Center, Booneville, AR*, <sup>4</sup>*College of Veterinary Medicine, Oklahoma State University, Stillwater, OK*, <sup>5</sup>*Department of Animal Science, University of Arkansas, Fayetteville, AR*.

Differences among ruminant species in forage selectivity offer potential for efficient utilization of pastures with a diverse array of plant species. Therefore, this experiment was conducted to determine effects of stocking rate (SR) on growth performance of growing sheep and goat wethers co-grazing mixed pastures. Grazing was for 16-wk periods in 2002 and 2003. Pastures consisted of various grasses, such as bermudagrass (*Cynodon dactylon*) and johnsongrass (*Sorghum halepense*), and forbs (e.g.,

ragweed; *Ambrosia* spp). Sheep (Katahdin) and goats ( $\geq 75\%$  Boer) averaged  $21 \pm 4.8$  and  $21 \pm 3.7$  kg initial BW, respectively, and were 4 to 5 mo of age when grazing began. Stocking rates were four (4), six (6), and eight (8) animals per 0.4-ha pasture, with equal numbers of sheep and goats. The nine pastures (three/treatment) were divided into four paddocks, which were sequentially grazed in 2-wk periods. There were year x SR interactions in herbage DM mass before ( $P < 0.05$ ) yr 1: 2,937, 3,298, and 3,351 kg/ha; yr 2: 3,033, 2,928, and 2,752 kg/ha (SE = 172.7)) and after grazing paddocks ( $P < 0.09$ ) yr 1: 2,535, 1,879, and 1,609 kg/ha; yr 2: 2,023, 1,507, and 996 kg/ha for 4, 6, and 8, respectively (SE = 111.3)). Year and SR interacted ( $P < 0.05$ ) in the percentage of grass determined by transect in paddocks post-grazing (yr 1: 66, 69, and 74%; yr 2: 50, 66, and 73% for 4, 6, and 8, respectively (SE = 8.4)) but not pre-grazing (60, 64, and 64% in year 1 and 48, 57, and 60% (SE = 7.0)). Average daily gain tended ( $P < 0.10$ ) to decrease linearly as SR increased (53, 44, and 41 g/d), and total BW gain per pasture increased linearly ( $P < 0.05$ ; 214, 266, and 327 g/d for 4, 6, and 8, respectively). There was a tendency ( $P < 0.08$ ) for an interaction in ADG between year and species (yr 1: 62 and 27 g/d; yr 2: 59 and 37 g/d for sheep and goats, respectively (SE = 4.1)). In conclusion, increasing the SR of sheep and goats co-grazing mixed grass/forb pastures tended to linearly decrease ADG but increase total BW gain per pasture. Post-grazing herbage mass  $\geq 1,000$  kg/ha suggests that shifts in selection of plants or plant parts differing in digestibility may have contributed to the effect of SR on ADG.

**Key Words:** Goats, Co-grazing, Stocking Rate

**127 Effect of pasture location and year on goat fecal egg counts.** S. P. Hart\*, J. O. Joseph, and A. L. Goetsch, *E (Kika) de la Garza American Institute for Goat Research, Langston University, Langston, OK*.

The objective of this study was to measure the effect of pasture location in the state of Oklahoma and month of grazing on fecal egg counts in yearling Boer x Spanish goats grazing for two summers. Goats grazed at six sites, each site with two or more grazing treatments such as current or previous year stocking rate, rotational grazing and co-species grazing with sheep or stocker heifers. There was a minimum of 10 animals per pasture and a total of 13 pastures representing 300 animals. All locations had significant browse available at the start of the study. Goats were dewormed with Moxidectin (0.5 mg/kg bw) prior to initiation of grazing in mid-May to early June. Goats were weighed and fecal samples were collected at approximately monthly intervals. Fecal egg counts (eggs per gram; EPG) were estimated by a modified McMaster technique. Data were log transformed prior to analysis of variance. Location had a major effect on EPG ( $P < 0.001$ ) with less important effects of month and the interaction of year x location ( $P < 0.001$ ,  $P < 0.001$ ). Back transformed mean EPG were 580, 5, 4, 2, 1 and 0 EPG for the locations. Many animals had 0 EPG throughout most of the grazing season at most locations. Eggs per gram increased as month of grazing advanced (2, 3, 8, and 25 for months 1 to 4). The location x year interaction was a result of one location having a high EPG in both years and two other locations having high EPG in one but not both years. The location with high EPG both years had greater annual rainfall than other locations. At the locations that had high EPG in only one year, animals were observed to graze grass close to the ground even though browse was available. In conclusion, location is an important consideration affecting parasitism and recommendations for its control, but the effects can be different among years.

**Key Words:** Internal parasites, Goat, Grazing