

43 Effect of rumen-protected conjugated linoleic acid (CLA) or linoleic acid on leptin and CLA content of bovine adipose depots. M.H. Gillis^{*1}, S.K. Duckett¹, J.R. Sackmann¹, and D.H. Keisler², ¹University of Georgia, Athens, ²University of Missouri, Columbia.

Thirty-six Angus-cross heifers (366 kg) were used to determine effects of dietary lipid sources on serum and adipose tissue leptin levels and fatty acid composition of intramuscular (IM), perianal (PA), and subcutaneous (SQ) lipid depots. Lipid was supplied to diets as either corn oil or rumen-protected conjugated linoleic acid (CLA) salt for two specific treatment periods of either 32 or 60 d. Following an initial feeding period of 56 d, heifers were fed one of three dietary treatments: 1) basal ration containing 88% concentrate and 12% grass hay (CON), 2) basal ration plus 4% corn oil (OIL), or 3) basal ration plus 2% rumen-protected CLA salt (CLA), containing 31% CLA-60. Circulating leptin levels were not affected ($P > 0.05$) by dietary treatment at any time during the trial. However, leptin concentration in adipose tissue was greater ($P < 0.05$) for heifers fed OIL compared to either CON or CLA diets, which were similar ($P > 0.05$). The cis-9, trans-11 CLA isomer and total CLA content was lowest ($P < 0.05$) in IM adipose tissue compared to PA and SQ, which did not differ ($P > 0.05$). The trans-10, cis-12 CLA concentration was highest ($P < 0.05$) for animals fed CLA and OIL diets for 60 d and lowest ($P < 0.05$) for CON, regardless of time on dietary treatment. CLA supplemented heifers had greater ($P < 0.05$) total CLA content than either CON or OIL fed. Adipose tissue concentration of C18:1 trans-11 was lower ($P < 0.05$) for CON than OIL or CLA, which were similar ($P > 0.05$). Percentages of C18:1 trans-10 were lowest ($P < 0.05$) in IM lipid compared to PA and SQ, which did not differ ($P > 0.05$). The ratio of cis-9, trans-11 to C18:1 trans-11 was higher ($P < 0.05$) for animals fed 60 d compared to 32 d, but did not differ ($P > 0.05$) between adipose depots. Feeding rumen-protected CLA increased total CLA isomers by 22%. IM lipid contained the lowest ($P < 0.05$) percentage of cis-9, trans-11 CLA, total CLA, C18:1 cis-9, C18:1 trans-10, and C18:1 trans-11. Based upon cis-9, trans-11 to C18:1 trans-11 ratio in duodenal digesta of steers fed similar diets and tissue ratio for this study, we estimate the percentage of cis-9, trans-11 resulting from desaturation of C18:1 trans-11 in adipose tissue at approximately 86%.

Key Words: CLA, Leptin, Beef Cattle

44 Carcass characteristics, fat color, and tenderness of beef finished on concentrate or forage. C.R. Kerth^{*}, Auburn University.

Charlais-Angus crossbred steers were fed one of three finishing diets to determine the effects of concentrate-finishing and forage-finishing on carcass characteristics, trimmed and untrimmed fat color, and loin and rib cooking losses and Warner-Bratzler shear force (WBSF) values. When the steers ($n = 30$) reached about 340 kg, they were randomly assigned to finishing systems consisting of rye grass only for 178 d (RG), rye grass for 125 days followed by 98 days of a high-concentrate, feedlot-type diet (RGC), or a high-concentrate diet for 82 days (CON). Steers from the RGC and CON groups were slaughtered when estimated backfat thickness reached 1.0 cm and steers from the RG group were slaughtered when the amount of rye grass present was not sufficient to maintain the animals. Steers finished on RG had lower ($P < 0.01$) hot carcass weight, actual 12th rib fat thickness, adjusted 12th rib fat thickness, ribeye area, and kidney, pelvic and heart fat compared to steers finished

on either RGC or CON, which did not differ ($P > 0.10$). Finishing system did not affect ($P > 0.2$) marbling, which averaged high slight in all three treatments. Subcutaneous rib and loin fat color (measured by L*, a*, and b*) in all three finishing systems was more white, and less red and yellow when the fat was trimmed to 0.3 cm compared to the untrimmed fat ($P < 0.01$). Regardless of trim level, RGC steers had fat that was more yellow than fat from CON steers but less yellow than fat from RG steers (as measured by b*, $P < 0.05$). Longissimus muscle cooking losses were not affected ($P > 0.7$) by finishing system in either the rib or loin. Loin longissimus muscle WBSF values from RGC and CON systems were similar ($P > 0.10$) and both were lower ($P < 0.05$) compared to longissimus muscle from RG steers. Warner-Bratzler shear values of longissimus muscle from the rib section did not differ among the three finishing systems ($P > 0.05$). These data indicate that steers finished on rye grass have similar quality grades as steers finished on grain, but have more yellow fat and muscle that may be less tender.

Key Words: Grass-fed Beef, Fat Color, Tenderness

45 Effects of biological type and forage feeding on carcass characteristics, fatty acid profiles, and sensory attributes of beef cattle. R. T. Baublits^{*1}, A. H. Brown, Jr.¹, F. W. Pohlman¹, C. J. Richards⁴, H. D. Loveday⁴, D. O. Onks³, Z. B. Johnson¹, C. A. Wells², R. E. Morrow², and B. A. Sandelin¹, ¹University of Arkansas, Fayetteville, AR, ²National Center for Appropriate Technology, Fayetteville, AR, ³University of Tennessee, Springhill, TN, ⁴University of Tennessee, Knoxville, TN.

The effects of biological type across different forage-based feeding systems were analyzed to determine differences in carcass quality, chemical composition, and sensory attributes. Small-framed/intermediate-maturing (SI), medium-framed/intermediate-maturing (MI), and large-framed/intermediate-maturing (LI) calves ($n = 53$) were randomly chosen and stratified across either orchardgrass/clover pasture with soyhull supplementation (O), fescue grass/clover pasture with soyhull supplementation (F), or fescue grass pasture overseeded with wheat and millet with no supplementation for the control (C). Effects for hot carcass weight showed that the F and O cattle were heavier ($P < 0.05$) than C. The F and O cattle had larger ($P < 0.05$) loin eye areas than C, but did not differ ($P > 0.05$). Control cattle (C) had less ($P < 0.05$) back fat and lower ($P < 0.05$) quality grades than F or O cattle, whereas F and O cattle did not differ ($P > 0.05$). The LI cattle were heavier ($P < 0.05$) and had larger ($P < 0.05$) loin eyes than SI, whereas SI, MI, and LI did not differ ($P > 0.05$) in terms of back fat or quality grade. The C carcasses had higher ($P < 0.05$) adipose L* values, lower ($P < 0.05$) adipose a* values, and lower ($P < 0.05$) adipose b* values than F or O. Percent total lipid was lower ($P < 0.05$), and percent moisture was higher ($P < 0.05$) for C compared to F and O. No differences were exhibited between biological types for percent total lipids or percent moisture ($P > 0.05$). The C steaks contained higher ($P < 0.05$) linolenic acid concentrations than F or O, and there were no differences ($P > 0.05$) between treatments for conjugated linolenic acid. Sensory evaluation revealed no differences ($P > 0.05$) between treatments or biological types for sensory characteristics. These results suggest that biological type may not influence quality grade for cattle supplemented with soyhulls on forage, and that supplementation can improve carcass quality without drastically altering the fatty acid profile of grass-fed cattle.

Key Words: Biological Type, Beef Cattle, Forage Feeding

Physiology

46 Some hematological and biochemical alterations of experimentally infected rabbits by *Pasteurella multocida*. Osama Abd-Alla^{*1}, Hesham El-Shewy¹, Hamdy Fetaih², and Fatma Yousef³, ¹Department of Clinical Pathology, College of Vet Med, Suez Canal Univ, Ismailia, EGYPT, ²Department of Pathology, College of Vet Med, Suez Canal Univ, Ismailia, EGYPT, ³Animal Health Institute, Giza, Egypt.

New Zealand rabbits (1 to 1.5 kg BW) were assigned to 5 groups of 5 rabbits each. First group was kept as control, and the other 4 groups were inoculated intranasally by 0.8, 0.4, 0.2, or 0.1 ml $\times 10^7$ CFU/mL/rabbit of *Pasteurella multocida*, respectively. Infected groups were examined after 2, 4, 7, and 21 d. Depression, sneezing, conjunctivitis, loss of appetite, and nervousness were noticed in all infected animals. At 2 and 4

d after infection, thrombocytopenia (175 ± 8.8 and 137 ± 4.1 vs $329 \pm 3.8 \times 10^3$ /mL), leukopenia (6.1 ± 0.39 and 7.1 ± 0.11 vs $9.3 \pm 0.25 \times 10^3$ /mL); ($P < 0.01$), and normocytic, normochromic anemia were observed. At 7 and 21 d postinfection, thrombocytosis (383 ± 19.2 and $687 \pm 46.4 \times 10^3$ /mL vs $329 \pm 3.8 \times 10^3$ /mL), leucocytosis (10.7 ± 0.34 and $10.65 \pm 0.45 \times 10^4$ /mL vs $9.3 \pm 0.25 \times 10^3$ /mL); ($P < 0.01$) mainly due to neutrophilia; and microcytic, hypochromic anemia were observed. Serum biochemical analysis of all infected groups showed elevation ($P < 0.01$) of transaminases; AST (82 ± 1.4 , 86 ± 1.7 , 125 ± 10.9 and 54.5 ± 1.6 vs 51 ± 4.2 U/I) and ALT (124 ± 1.8 , 79 ± 1.8 , 95 ± 5.2 and 66.8 ± 2.1 vs 64 ± 1.8 U/I), respectively with hyperbilirubinemia and hypoglycemia. Also, there were decreased ($P < 0.01$) albumin/globulin ratios (1.89 ± 0.11 , 1.79 ± 0.12 , 0.93 ± 0.15 and 0.87 ± 0.15 vs 3.2

± 0.23) due to hyperglobulinemia and hypoalbuminemia. Furthermore, there were increases ($P < 0.01$) in blood urea nitrogen (27.4 ± 0.93 , 18.1 ± 0.43 , 21 ± 0.7 and 21.4 ± 0.58 vs 15.5 ± 0.29 mg/dL, uric acid (4.58 ± 0.26 , 4.2 ± 0.09 , 4.9 ± 0.67 and 4.6 ± 0.25 vs 2.63 ± 0.23 mg/dL, and creatinine (1.9 ± 0.22 , 1.7 ± 0.18 , 1.48 ± 0.16 and 1.8 ± 0.03 vs 0.97 ± 0.08 mg/dL) in addition to hypocalcemia and hyperphosphatemia.

Key Words: Hematological, Biochemical, *Pasteurella multocida*

47 Interaction of ergotamine with liver cytochrome P450 3A4 in rats. A. S. Moubarak*, H. X. Wang, Z. B. Johnson, and C. F. Rosenkrans, Jr., *University of Arkansas, Fayetteville.*

This study was conducted to investigate the effect of ergotamine (ET) on the induction of cytochrome P450 3A4 (CYP 3A4) and comparative effects in vivo and in vitro. Sprague-Dawley rats (BW ~ 250 g) were treated via i.p. injection daily for 4 d as follows: Control (0.5 ml of only corn oil); Dexamethasone treatment (100 mM of dexamethasone in corn oil); and Ergotamine treatment (100mM of ET in corn oil). Liver tissues were collected from each group ($n = 5$) and their corresponding liver microsomes were prepared. Cytochrome P450 3A4 activity was evaluated using ET and its isomers as substrates in medium containing liver microsomes and NADPH at 37°C for 30 min. The disappearance of the substrate and the appearance of the metabolites were measured by HPLC. Liver microsomes from rats pretreated with dexamethasone, a specific inducer of CYP 3A4, were more ($P < 0.01$) active than microsomes from the control animals in the biotransformation of ET (32.1 and 7.0 nM/min, respectively; SE = 4.83) or ET-isomer (21.6 and 4.7 nM/min, respectively SE = 1.70) into its corresponding ET metabolites (M1 and M2) and ET isomer metabolites (M1-iso and M2-iso). The ergotamine treatment produced no increase ($P > 0.05$) in activity of CYP 3A4 when compared to the control group for ET (5.2 vs 7.0 nM ET/min; SE = 4.83) or ET isomer (1.5 vs 4.7 nM ET isomer/min; SE = 1.70). When ketoconazole was used as specific inhibitor of CYP 3A4, ET metabolism was inhibited in a dose dependent fashion reaching a maximum at an inhibitor to substrate ratio of greater than one and LD50 at 2.0 nM of ketoconazole. The data presented in this study suggest that although the ergot alkaloid ergotamine and its isomer are ideal substrates for the isozyme CYP 3A4, these compounds have no effect on the induction of CYP 3A4 after 4 d of treatment.

Key Words: Ergotamine, CYP 3A4, Liver Microsomes

48 Effects of administration of ergotamine tartrate to simulate fescue toxicosis on fertility of yearling beef bulls. F. N. Schrick¹, J. C. Waller*¹, J. L. Edwards¹, M. D. Davis¹, H. E. Blackmon¹, F. N. Scenna¹, N. R. Rohrbach¹, A. M. Saxton¹, H. S. Adair², and F. M. Hopkins², ¹Department of Animal Science, ²Department of Large Animal Clinical Sciences, University of Tennessee, Knoxville..

Sixteen bulls were used to investigate effects of administration of ergotamine tartrate (ET) on semen characteristics, fertilization potential, and endocrine profiles. Bulls were allotted to treatments by weight (~ 350 kg), hip height, scrotal circumference, and age (~ 270 d). Bulls allotted to a diet of cracked corn, corn silage, and soybean meal served as controls (CON, $n = 8$). Daily topdressing of the diet with 40 µg/kg body weight of ET was provided to the treatment group (ET, $n = 8$). To maintain the dosage of 40 µg/kg BW throughout the experimental period (November 15 through June 26), amount of ET administered was altered as BW increased. Blood samples, BW, scrotal circumference (SC) and rectal temperatures (RT) were collected every 2 wk. Semen samples were obtained every 60 d for determination of motility and morphology. During May and June, testicular core temperatures were measured by scrotal thermography immediately before electroejaculation. Semen from two bulls per treatment with similar scrotal circumferences was extended and returned to the laboratory for further assessment. Comparisons between ET and CON for in vitro fertilization (IVF) measures were determined using PROC FREQ procedure. All other variables were analyzed by the Mixed procedure. Administration of ET increased RT (39.3 ± 0.05 °C) compared to CON bulls (39.1 ± 0.05 °C; $P = 0.02$); however, prolactin did not differ ($P = 0.10$). Neither SC ($P = 0.68$) nor testosterone ($P = 0.17$) differed throughout the experimental period between groups. Sperm motility and morphology were similar between ET and CON ($P = 0.83$; $P = 0.51$, respectively). However, bulls exposed to ET had lower testicular core temperatures (31.4 ± 0.3 °C) compared to CON bulls (33.0 ± 0.3 °C; $P = 0.004$). Cleavage rate of oocytes

cultured with semen from bulls fed ET was reduced compared to CON (51 vs. 69%, respectively; $P = 0.001$). In conclusion, extended exposure of bulls to ergotamine tartrate appears to reduce fertilization ability of sperm. This was possibly through a vasoconstrictive action as evidenced by the reduction in testicular core temperature.

Key Words: Fescue Toxicosis, Bull, Fertility

49 Comparison of testicular and epididymal sperm content in Angus, Brahman, and Romosinuano bulls. J.W. Koch^{1,2,3}, S.R. Tatman³, C.C. Chase, Jr.⁴, T.H. Welsh, Jr.², and R.D. Randel*³, ¹Prairie View A&M University, Prairie View, TX, ²Texas Agricultural Experiment Station, College Station, ³Overton, ⁴USDA, ARS, STARS, Brooksville, FL.

Excessive heat can be detrimental to spermatogenesis in bulls. The objective was to determine if testicular and epididymal sperm content and daily sperm production (DSP) of tropically-adapted *Bos taurus* (Romosinuano, R; $n = 10$) is more similar to that of temperate *Bos taurus* (Angus, A; $n = 7$) or tropically-adapted *Bos indicus* (Brahman, B; $n = 8$) bulls. Sperm content was determined via microscopy in homogenates of testicular parenchyma and epididymal sections from each sexually mature bull. Romosinuano had greater ($P \leq 0.01$) testicular sperm content/g of parenchyma and DSP/g than A with B bulls being intermediate (sperm content/g, 73.8 ± 3.4 vs 56.9 ± 4.4 and $64.6 \pm 3.8 \times 10^6$, respectively; DSP/g, 13.9 ± 0.6 vs 10.7 ± 0.8 and $12.2 \pm 0.7 \times 10^6$, respectively). Brahman had greater ($P \leq 0.001$) testicular sperm content and DSP than R and A bulls which were similar (sperm content, 41.6 ± 3.4 vs 28.5 ± 3.0 and $20.6 \pm 3.9 \times 10^9$, respectively; DSP, 7.8 ± 0.6 vs 5.4 ± 0.6 and $3.9 \pm 0.7 \times 10^9$, respectively). Brahman bulls had greater ($P \leq 0.01$) total caput sperm content than R and A bulls which were similar (6.0 ± 0.5 vs 3.7 ± 0.5 and $3.4 \pm 0.6 \times 10^9$, respectively). Brahman also had greater ($P \leq 0.01$) corpus sperm content/g than R but both breeds were greater ($P \leq 0.01$) than A bulls (650.9 ± 44.8 vs 381.9 ± 40.1 vs $179.6 \pm 51.8 \times 10^6$, respectively). Brahman had greater ($P \leq 0.01$) total corpus sperm content than R and A bulls (1662.3 ± 91.0 vs 427.4 ± 81.4 and $219.5 \pm 105.1 \times 10^6$, respectively). Romosinuano had greater ($P \leq 0.01$) cauda sperm content/g than B and A bulls (1915.3 ± 134.8 vs 1307.9 ± 150.8 and $852 \pm 174.1 \times 10^6$, respectively). Brahman and R had greater ($P \leq 0.01$) total cauda sperm content than A bulls (7.0 ± 0.8 and 6.9 ± 0.7 vs $2.8 \pm 0.9 \times 10^9$, respectively). We conclude that testicular and epididymal sperm content and DSP of tropically-adapted *Bos taurus* bulls are more similar to tropically-adapted *Bos indicus* bulls than to temperate *Bos taurus* bulls raised in the subtropics.

Key Words: Testis, Epididymis, Bulls

50 Evaluating the relationship between environmental temperature and physiological temperatures in hair sheep rams in the tropics. O.T. Isles*, R.W. Godfrey, R.E. Dodson, and A.J. Weis, University of the Virgin Islands, Agricultural Experiment Station, St. Croix.

This study was conducted to determine the relationship between the environmental temperature and physiological temperatures of St. Croix White (STX; $n = 3$) and Barbados Blackbelly (BB; $n = 3$) hair sheep rams in the tropics. Rams were paired across breed by BW, scrotal circumference, and age. Each pair of rams was evaluated once during a 3-wk period for 48 h. Environmental data collected included temperature and relative humidity, which were used to calculate temperature-humidity index (THI). Physiological data collected at 5-min intervals included subcutaneous, rectal, and scrotal temperatures of each ram using HOBO data loggers (Onset Corporation). Each pair of rams was placed in a pasture (0.12 ha) for the 48-h period. The mean temperature and THI during the daytime were 29.8 ± 0.05 °C and 80.6 ± 0.05 , respectively. The mean nighttime temperature and THI were 25.9 ± 0.05 °C and 76.7 ± 0.05 , respectively. Subcutaneous temperature of BB rams was higher ($P < 0.0001$) than STX rams during the day (38.9 ± 0.04 vs. 38.7 ± 0.04 °C, respectively) but there was no difference ($P > 0.10$) at night (37.5 ± 0.04 vs. 37.5 ± 0.04 °C, respectively). Rectal temperature of BB rams was higher ($P < 0.0001$) than STX rams during the day (39.3 ± 0.02 vs. 38.9 ± 0.02 °C, respectively) and night (39.5 ± 0.03 vs. 39.0 ± 0.02 °C, respectively). Scrotal temperature of BB rams was lower ($P < 0.0001$) than STX rams during the day (34.9 ± 0.04 vs. 35.4 ± 0.03 °C, respectively) and night (34.4 ± 0.05 vs. 35.4 ± 0.03 °C, respectively). Environmental temperature was positively correlated (P

< 0.0001) with subcutaneous ($r = 0.699$), rectal ($r = 0.132$) and scrotal ($r = 0.318$) temperature across breeds. These results indicate that BB rams do not have the ability to regulate body temperature as well as STX rams. This may occur because the dark hair coat of the BB is not able to reflect sunlight as well as the white hair coat of the STX. This project was supported by NIH/NIGMS/MBRS-RISE GM61325.

Key Words: Sheep, Environment, Scrotum

51 Concentrations of leptin in serum and milk from gilts fed a high- or low-energy diet during gestation. M.J. Estienne*, A.F. Harper, D.M. Kozink, and J.W. Knight, *Virginia Polytechnic Institute and State University, Blacksburg.*

Low feed intake during lactation extends the weaning-to-estrus interval, thus increasing sow non-productive days. Research is needed to determine causes and mechanisms of sub-optimal feed consumption so that interventional management strategies can be developed. Leptin, a hormone produced by adipose tissue, has been implicated in the regulation of feed intake in swine. The objective of this study was to quantify concentrations of leptin in serum and milk from gilts fed diets during gestation that differed in energy level. Beginning at 45 d of gestation and continuing throughout pregnancy, Yorkshire x Landrace gilts (185.3 ± 0.5 kg BW and 20.0 ± 0.3 mm backfat) received either a high-energy (6,882 kcal ME/d) or low-energy (5,221 kcal ME/d) diet ($n = 9$ /group). All gilts had ad libitum access to a standard diet throughout a 21-d lactation period. During gestation, gilts consuming the high-energy diet gained more BW (29.1 ± 1.7 vs. 15.4 ± 1.7 kg; $P < 0.01$) and last-rib backfat thickness (0.8 ± 0.6 vs. -1.6 ± 0.6 mm; $P < 0.01$) than gilts fed the low-energy diet; however, serum concentrations of leptin remained similar ($P = 0.35$) between groups (1.9 ± 0.2 ng/mL). Within 24 h after farrowing, gilts fed the high-energy diet had greater concentrations of leptin in serum (2.8 ± 0.3 vs. 2.0 ± 0.3 ng/mL; $P = 0.07$) and milk (57.1 ± 4.5 vs. 42.2 ± 4.5 ng/mL; $P = 0.02$) than gilts that consumed the low-energy diet; across treatments, backfat thickness and leptin levels in serum were positively correlated ($r^2 = 0.51$; $P = 0.03$). At weaning, backfat thickness (15.8 ± 0.3 vs. 14.7 ± 0.3 mm; $P = 0.03$), but not BW (186.0 ± 0.9 kg) or serum (2.0 ± 0.2 ng/mL) and milk (39.7 ± 3.1 ng/mL) concentrations of leptin ($P > 0.1$), were greater for gilts fed the high-energy diet during gestation. Gilts that were fed the low-energy diet during gestation consumed more feed (6.8 ± 0.1 vs. 6.1 ± 0.1 kg/d) during week 2 of lactation ($P = 0.06$). Our results suggest that altering the level of energy in the diet of gestating swine can influence circulating and milk concentrations of leptin, as well as feed consumption, during lactation. High concentrations of leptin in sow milk may implicate the hormone in suckling behavior and growth and development of neonatal pigs.

Key Words: Leptin, Gestation, Gilts

52 Prepubertal administration of porcine Epidermal Growth Factor increases litter size. John McGlone*¹, Deidre Anderson¹, and Vaughan Lee², ¹Texas Tech University, ²Texas Tech University Health Sciences Center, Lubbock.

Two studies were conducted to evaluate the effects of porcine Epidermal Growth Factor (pEGF) on litter size in pigs. Recombinant pEGF was generated by RT-PCR and subcloned into a bacterial vector. The recombinant pEGF molecule had 5 histidine residues that aided in protein isolation and its identity was confirmed by Western blot analysis. In the first pilot study, four prepubertal gilts were selected from each of three litters. Littermates received either 1 mg/day pEGF (equivalent to 0.03 mg mEGF biological activity) or control vehicle each day from 14 to 28 days of life. The pEGF or control solution were administered by mini-osmotic pump. Half the gilts were sacrificed at about 70 d of age for examination of ovarian development by histology. The remaining half were mated to a single sire and taken to term. The second study involved 26 or 28 gilts per treatment (82 gilts farrowing in total). Three doses of pEGF were used (0, 1 or 2 mg/d) and the pEGF was given by a single daily i.m. injection. Half the gilts received a single injection of 5 mL of P.G.600 (Intervet) at 70 days of age and half received a control injection. P.G.600 had no effects on reproductive measures and was dropped from the analyses. Linear contrasts were used to compare control with pEGF treatments (1 or 2 mg/d did not differ). In the first pilot study, gilts had morphological evidence of enhanced follicular development and had 3.33 more pigs born alive when treated with pEGF compared with gilts in the control treatment. In the second study, both

doses of pEGF increased ($P = 0.05$) total numbers of pigs born per litter. Control pigs had 10.1, while each pEGF treatment produced 12.2 pigs born per litter (SE = 0.83). Gilts treated with pEGF also tended ($P = 0.08$) to wean 1.5 more pigs per litter than control litters. Days to onset of puberty, piglet preweaning survival and body weights at 21 days were not different among treatments ($P > 0.15$). In conclusion, pEGF can increase litter size in gilts when administered to the prepubertal gilt.

Key Words: Pig, Epidermal Growth Factor, Litter size

53 Characterization of collagen degradation marker excretion during postpartum uterine involution in sows. B. A. Belstra*, W. L. Flowers, M. T. See, and W. J. Croom, *North Carolina State University, Raleigh.*

During the first three weeks postpartum, sow uteri exhibit a 90% decrease in wet weight as 0.7 to 0.9 kg of collagen is degraded during a process known as involution. Lactation lengths currently in use in the swine industry may not provide enough time to complete this vital process and may cause increased embryo mortality and reproductive failure. Our objective was to characterize the excretion of the collagen degradation markers pyridinoline and deoxypyridinoline (crosslinks) during this period. Urine samples from 21 multiparous sows that lactated for 21.3 \pm 0.3 d were collected on d 1, 4, 7, 10, 13, 16, 19 postpartum and d 6 postweaning and stored at -20°C . A colorimetric assay for creatinine (Cre) and an ELISA for crosslinks were performed. Intra and interassay CVs for both assays were $< 5\%$. Marker data are expressed as a ratio to Cre to standardize samples for urine excretion rate. Mean crosslinks ratios increased from 74.6 ± 12.5 to 153.8 ± 14.9 nmol / mmol Cre from d 1 to 10, and then decreased to 100.6 ± 9.3 nmol / mmol Cre on d 19. Peak crosslinks ratio in each sow's excretion profile was defined as the maximum value that exceeded the mean + 1.5 S.D. Sows exhibited one of four crosslinks excretion patterns: peak on d 1 or 4 (early, $n = 3$), peak on d 7 (mid, $n = 4$), peak on d 10, 13 or 16 (late, $n = 7$), or no peak (none, $n = 7$). There was no difference ($P > 0.10$) in sow parity, pre-farrow weight, total pig birth weight, total born, born alive, number of pigs suckled, sow weaning weight, or sow lactation weight change between the peak classes (early, mid, late, none) based on GLM analysis. These data support an increase in crosslinks excretion during the involution period but also highlight variation in the timing and amplitude of the increase between sows. Relating crosslinks excretion to a physical measure of uterine involution may clarify its relationship to this process and help determine the applicability of these markers.

Key Words: Collagen, Sow, Uterine Involution

54 Enhancing feed intake during the early lactation period in sows. J. Miller*, L.A. Solis, and J.C. Laurenz, *Texas A&M University-Kingsville.*

The following was a pilot study designed to investigate the effects of a palatability-enhancing product (PEP[®] 1000; Biomim, Herzogenburg, Austria) fed before and during lactation on sow intake, sow performance, and subsequent piglet performance. Crossbred sows ($n = 11$) were selected at approximately 14 days before farrowing and assigned by weight and parity to one of two treatments. All sows were fed a standard lactation diet containing either 0 (Control; $n = 5$) or 2 kg/t PEP[®] 1000 (PEP; $n = 6$) beginning at 10 days before expected farrowing dates and continuing through weaning. Approximately 2 to 4 days before farrowing, sows were moved to farrowing crates and feed intake recorded twice daily for each sow through weaning. After farrowing (day 1), all piglets were weighed and tattooed for permanent identification. Sows and piglets were then weighed at weekly intervals. By design, treatments did not differ ($P > 0.05$) in initial sow weight (240 14 kg) or parity (3.5 0.5). In addition, supplementation with PEP did not effect the number of pigs born live (10.5 0.9), piglet birthweight (1.4 0.1 kg), or number of pigs weaned (8.5 0.7). As expected feed intake for Control sows following lactation (days 1 to 3) was low (0.7 0.3, 2.0 0.7 and 3.0 0.3 kg/day, respectively) and gradually increased ($P < 0.01$) up to day 14 of lactation (5.2 0.7 kg/day). In contrast, sows fed PEP consumed more ($P < 0.05$) feed in early lactation (1.6 0.4, 4.8 0.8, and 5.5 0.6 kg/day for days 1 to 3, respectively) and reached maximum feed intake levels much earlier than control (7.1 0.5 kg/day by day 9). Although not statistically significant ($P > 0.05$), sows supplemented with PEP had numerically less weight loss during the first two weeks following farrowing (3.5 1.9 vs. 12.1 3.3 kg for PEP vs. Control sows, respectively). In addition, there was a tendency ($P < 0.20$) for piglets from sows treated with PEP to be

heavier at days 7, 14, and 21 of age (2.5, 4.1, and 5.8 vs. 2.3, 3.8, and 5.4 kg, for PEP vs. Control piglets, respectively; SEM = 0.1 kg). Overall, these results demonstrate that supplementation of sows with PEP does improve feed intake during the early lactation period and may improve sow and piglet performance.

Key Words: Heat Stress, Intake, Palatability

55 Real-time monitoring of *Salmonella* in swine: Specificity and sensitivity of bacterial detection through the gastrointestinal tracts of juvenile and market weight pigs. S.T. Willard*¹, R.H. Bailey¹, M.L. Rybolt¹, B.S. Gandy¹, P.L. Ryan¹, and D.C. Lay², ¹Mississippi State University, Mississippi State, Mississippi, ²USDA-ARS, West Lafayette, Indiana.

We have demonstrated that *Salmonella* can be monitored non-invasively using biophotonic paradigms (*Salmonella* expressing light-emitting proteins) in living neonatal pigs. Nevertheless, questions remain concerning system sensitivity and adaptations of these methodologies for investigations of pre-harvest food safety issues in market weight (MW) pigs. The aim of this study was to quantify the relationship between the amount of bacteria present (colony forming units; CFU), photonic emissions, and the influence of tissue depth on photon detection in juvenile (3 kg) and MW (100 kg) pigs. Gastrointestinal tracts (GI) were collected post-mortem from pigs at 14 (juvenile; n = 6) and 170 (MW; n = 6) days of age, and sectioned into 4-cm segments for the small intestine (SI), large intestine (cecum: CE; colon: CO) and stomach (ST). Skin from the ventral surface of juvenile pigs was also analyzed. GI and skin sections were placed separately on 96-well plates containing varying concentrations of *Salmonella-lux* (*Salmonella anatum* engineered to express luciferase). Data were analyzed to ascertain changes in *Salmonella-lux*-induced specific photonic emissions (SPE) as detected through the GI and skin, and are reported as SPE or as a % of SPE captured. Two levels of photonic emissions were tested (High: $1.8 \pm 0.07 \times 10^6$ SPE; Low $0.84 \pm 0.05 \times 10^6$ SPE), which represented a two-fold difference in concentrations of *Salmonella-lux*. Similar recovery percentages for High and Low SPE were observed ($P > 0.10$), therefore data were pooled for each GI segment within juvenile and MW pigs. For juvenile pigs, 9.9 ± 1.1 , 8.8 ± 1.2 , 6.4 ± 0.8 and 1.5 ± 0.5 % of SPE were detectable through the SI, CO, CE and ST, respectively, and 0.98 ± 0.1 % through the skin. For MW pigs, 1.6 ± 0.13 , 1.7 ± 0.17 , 0.79 ± 0.17 and 0.08 ± 0.05 % of SPE were detectable through the SI, CO, CE and ST, respectively. The respective juvenile GI segments permitted more SPE to pass through ($P < 0.05$) than MW GI segments. System performance data indicated that quantifiable SPE specific to bacterial presence equated to 0.2 to 2×10^6 CFU depending on the GI section imaged. In summary, real-time imaging of *Salmonella* is feasible through juvenile and MW pig GI tracts. Through improved imaging technologies, this technology will enable the identification of sites within swine (*in vivo* or post-mortem) where *Salmonella* may congregate and establish pathogenicity.

Key Words: Swine, *Salmonella*, Biophotonics

56 Effect of supplemental molasses on equine salivary pH and subsequent bacterial acid production. B.C. Housewright*, E.L. Swain, J. Hamra, L.L. Pickering, H.L. Richardson, and D.B. Crenshaw, Texas A&M University - Commerce.

Dental degeneration in horses is a major concern from perspectives of health, performance, and dietary utilization. Producers spend hundreds of dollars per head annually in dental maintenance (floating teeth). Eight yearling horses including four colts and four fillies were used to determine if the addition of molasses has any effect on salivary pH and subsequent bacterial acid production. Horses were randomly assigned to two treatments, using two colts and two fillies per treatment. Treatments were: pelleted commercial feed with 14% crude protein and 6% fat (CTRL) or an identical pelleted feed with 5% added molasses (MOL). Horses were fed 1.13 kg twice daily (0800 and 1800 h). Just before feeding, 5% molasses, as fed basis, was added to the horses' rations assigned to MOL treatment. A 24-d adaptation period was allowed for horses to acclimate to specific diet treatment. Following the adaptation period, salivary samples were taken on four subsequent days. A 2-ml sample was taken from each horse using sterilized cotton swabs as a medium. Samples were taken just before feeding for a baseline measurement (BL), followed by two additional samples at 15 min and 45 min after all feed was consumed. Samples were immediately analyzed for pH and 300 μ l were plated on sterilized Snyder Test Agar, for determination of presence

of acid-producing bacteria following a 96 h incubation time. No changes ($P > 0.05$) in salivary pH were detected at 15 min or 45 min after feeding in CTRL. Salivary pH at 15 min decreased ($P < 0.05$) from BL measurement by 0.44 pH units for horses receiving MOL diet. However, pH at 45 min after feeding returned to BL levels ($P > 0.05$). Presence of acid producing bacteria was slightly higher ($P = 0.06$) for horses supplemented with molasses. Supplementation with molasses does initially decrease equine salivary pH and possibly increases the presence of acid-producing bacteria. However, pH returns to baseline levels by 45 min after feed consumption.

Key Words: Equine, Saliva, Molasses

57 The effect of cooling strategy during summer heat stress on production performance and body composition quality traits in lactating Holstein dairy cattle. H.L. Evans*^{1,2}, J. Murphy³, E. Cuadra⁴, S.T. Willard², and R.C. Vann¹, ¹Brown Loam Branch Experiment Station, Raymond, Mississippi, ²Mississippi State University, Mississippi State, Mississippi, ³Coastal Plains Branch Experiment Station, Newton, Mississippi, ⁴Alcorn State University, Alcorn State, Mississippi.

Heat stress can negatively impact physiological processes and production in lactating dairy cows. Environmental cooling strategies can alleviate some of these detrimental effects, yet the effects of cooling method on the repartitioning of fat and changes in body composition remain poorly understood. The objective of this study was to determine whether type of cooling system influences production and body composition quality traits in dairy cattle. Lactating Holstein cows (n = 96) were assigned to equal groups based on high (HMP) or low (LMP) milk production and cooling strategy as follows: HMP, Fan only (HF; n = 24); HMP, Fan and Sprinklers (HFS; n = 24); LMP, Fan only (LF; n = 24); and LMP, Fan and Sprinklers (LFS; n = 24). Following a 14-d acclimation period within groups, data were collected before milking at 14-d intervals for 86 d. Data included respiration rate (RR; breaths/min), dorsal coat temperature using infrared thermometers (DIR; °C), rectal temperature (RT; °C), body condition score (BCS) and body weight (BW). Measurements by real-time ultrasound (RTU) consisted of percent intramuscular fat (%IMF) of the Longissimus muscle at the 11, 12, and 13th ribs, back fat thickness (BF), rump fat thickness (RF), gluteus medius depth (GMD). Ambient temperature (TEMP), relative humidity (RH) and temperature-humidity index (THI) were monitored at 5-min intervals throughout the trial using remote data loggers. Mean daily TEMP, RH and THI were 25.8 ± 0.03 °C, 83.6 ± 0.13 and 75.9 ± 0.03 . Peak daily TEMP, RH and THI were 33.9 ± 0.26 °C, 51.5 ± 1.2 and 83.4 ± 0.28 . Cows in the FS groups had lower ($P < 0.05$) RT, DIR and RR than cows in the F only groups. BCS and BW change during the 86 d trial did not differ ($P > 0.10$) relative to cooling strategy, yet LMP cows gained more weight ($P < 0.03$) than HMP cows. Cooling strategy (F vs. FS) did not influence ($P > 0.10$) changes in BF, RF or GMD, yet LMP cows had higher ($P < 0.05$) BF, RF and GMD than HMP cows. Low MP cows had a higher ($P < 0.01$) %IMF than HMP cows; however the %IMF change during the 86-d trial did not differ ($P > 0.10$) relative to level of MP or cooling strategy. In summary, expected differences between HMP and LMP cows were observed in body composition traits; however cooling strategy did not influence those measures within groups.

Key Words: Intramuscular Fat, Dairy Cattle, Cooling Systems

58 The effect of 6-Methoxybenzoxazolinone (MBOA) on PMSG-induced superovulatory responses in St. Croix White ewes. T. Dickerson*¹, R. Godfrey², R. Dodson², A. Weis², and S. Willard¹, ¹Mississippi State University, Mississippi State, Mississippi, ²University of the Virgin Islands, St. Croix, USVI.

The purpose of this study was to evaluate the effectiveness of the plant metabolite 6-Methoxybenzoxazolinone (MBOA) in combination with PMSG in a superovulation program of St. Croix White ewes. Ewes (n = 44) were synchronized using an intravaginal progesterone (P4) sponge for 14 d followed by hCG administration (750 IU i.m.) 1 d after sponge removal (d 0). Ewes were assigned to one of six treatment groups as follows: Control I (n = 7) received no PMSG or MBOA; Control II (n = 7) received PMSG (1000 IU i.m.) on d -1; Low MBOA (n = 7; 0.43 mg/kg) and High MBOA (n = 7; 1.15 mg/kg) received only MBOA on d -1; Low MBOA + PMSG (n = 8) and High MBOA + PMSG (n = 8) received injections of MBOA and PMSG on d -1. The

MBOA was dissolved in 100% propylene glycol and administered i.m. A sterile ram with a crayon-marking harness detected estrus. Number of corpora lutea (CL) and follicles were counted on d 9 via laparoscopy. For all ewes, 89 % exhibited estrus post-synchrony. Interval to estrus did not differ ($P > 0.10$) between ewes receiving MBOA alone or with PMSG and non-superovulated ewes (Control I). Low MBOA and High MBOA ewes tended ($P < 0.10$) to have a longer interval to estrus, and Low MBOA + PMSG ewes had a longer interval to estrus ($P < 0.04$), than superovulated ewes (Control II). The MBOA-treated ewes (High or Low MBOA) did not differ ($P > 0.10$) in number of CL from non-superovulated ewes (Control I). Similarly, MBOA + PMSG-treated ewes (High or Low MBOA) did not differ ($P > 0.10$) in number of CL from superovulated ewes (Control II). Mean number of follicles did not differ ($P > 0.10$) in MBOA-treated ewes (High or Low MBOA) compared to non-superovulated ewes (Control I). Mean number of follicles was not different ($P > 0.10$) between High MBOA + PMSG and superovulated ewes (Control II). The Low MBOA + PMSG ewes tended to have more ($P < 0.10$) follicles than did superovulated ewes (Control II). These results indicate that MBOA did not enhance the ovulatory responses of superovulated hair sheep ewes but did alter follicular populations of the subsequent estrous cycle.

Key Words: MBOA, Sheep, Superovulation

59 Effects of prostaglandins E and F on early embryonic development in the goat. B.L. Sayre*, M.P.L. Dismann, and J.P. Tritschler, *Virginia State University, Petersburg, VA.*

Previous data indicated prostaglandin E (PGE) increased ovine embryonic hatching rate, and prostaglandin F (PGF) reduced development of rabbit, bovine, and rat embryos. The objective of this experiment was to determine the effects of PGE and PGF on embryonic development of caprine embryos. Estrus was synchronized in does ($n = 25$) with medroxyprogesterone acetate (MPA) pessaries for 12 d. Does were superovulated using 20 units of FSH. On d 6 following estrus, embryos were flushed ($n = 128$) and incubated individually in a 25 μ L droplet of TCM-199 with 25 mM HEPES and BSA (8 mg/mL) for 6 d at 38.5°C in a 5% CO₂:air atmosphere with one of the following treatments: 1) control (0.001% EtOH), 2) PGE (7 ng/mL), 3) PGF (7 ng/mL), 4) low PGE:high PGF (3.5:14 ng/mL), 5) balanced PGE:PGF (7:7 ng/mL), or 6) high PGE:low PGF (14:3.5 ng/mL). Data were analyzed with the GLM and GENMOD procedures of SAS. A majority (92.0%) of does expressed estrus after treatment with MPA pessaries and FSH during the early anestrous period (April-June). The number of ovulations (8.4) and number of embryos collected (5.1) did not decline ($P > 0.05$) as the anestrous period deepened. Treatment with PGE alone reduced ($P = 0.07$) hatching rate (1/17; 6%), whereas the hatching rates of embryos treated with PGF (9/18; 50%), low PGE:high PGF (8/16; 50%), and balanced PGE:PGF (11/18; 61%) were similar to control (6/18; 33%). In contrast, both development of morula to blastocysts and hatching rate were increased ($P < 0.05$) with high PGE:low PGF (6/6; 100% and 13/18; 72%, respectively). All other treatments did not affect ($P > 0.05$) development of morula to blastocysts. Based on the literature, PGF was expected to reduce hatching rates, and PGE was expected to increase hatching rates. In contrast, in this experiment PGE reduced embryonic hatching rate, and PGF had no effect. While high concentrations of PGE with PGF improved hatching rates, increased concentrations of PGF did not affect embryonic development. Further studies are needed to elucidate the roles of PGE and PGF on regulation of embryonic blastocoele formation and hatching.

Key Words: Goat, Prostaglandins, Embryo

60 Prediction of blood plasma progesterone via near infrared transmittance spectroscopy. D. Tolleson*¹, D. Rabbe², R. Randel¹, J. Stuth¹, and K. Busch², ¹Texas A&M University Agriculture Program, ²Baylor University Dept. of Chemistry and Biochemistry.

The objective of this experiment was to determine if near infrared transmittance spectroscopy of blood plasma could: 1) discriminate between cattle differing in reproductive status, and 2) quantify plasma progesterone (P4) concentration. Plasma was collected from three treatment groups: 8 ovariectomized (OVX), 8 early (45 to 60 d, EARLY), and 8 late (> 240 d, LATE) pregnant Brahman (*Bos indicus*) cows. P4 was determined by radioimmunoassay. Intra-assay coefficient of variation = 9.88 %, detection limit = 0.047 ng/mL, maximum and non-specific binding = 34.31 and 5.45 %, respectively. Mean plasma P4 = 0.83 ± 0.42 ,

11.87 ± 1.77 , and 8.30 ± 0.89 ng/mL ($P < 0.01$) for OVX, EARLY, and LATE respectively. Near infrared (NIR) spectra (4000 to 10000 cm^{-1}) were collected on a Thermo-Mattson Model GL-5020 FTNIR spectrometer using a quartz cell with a 2-mm path length. Principal components (PC) of 1st derivative NIR spectra were used in a partial least squares regression to predict P4 concentration or to generate X-Y plots of PC scores to identify groups. Three primary groups were identified. Group 1 contained eight OVX samples. Group 2 contained seven LATE and one EARLY. Group 3 consisted of seven EARLY and two LATE. One sample in the OVX group had 3.73 ng/mL P4. The EARLY sample misidentified had 7.94 ng/ml P4, the two LATE samples misidentified had 7.83 and 11.96 ng/mL P4, respectively. Mean P4 was 0.83 ± 0.42 , 7.79 ± 0.83 , and 11.86 ± 1.57 , ng/mL ($P < 0.01$) for 1, 2, and 3, respectively. Segregation of these samples was based on physiological status as well as P4 concentration within physiological status. Using these 24 samples for calibration resulted in a P4 predictive equation with $R^2 = 0.98$ and SE of calibration = 1.08 ng/mL. The P4 predictive equation met minimum criteria for $R^2 (> 0.8)$. The SE however, indicates that prediction at low P4 concentrations could be insufficiently precise. A larger, more diverse calibration set should be collected to better evaluate the technique.

Key Words: Near Infrared Spectroscopy, Progesterone, Plasma

61 Live animal carcass traits as influenced by estrous synchronization protocol and effects on fertility in nulliparous beef heifers. H.L. Evans*^{1,2}, S.T. Willard², and R.C. Vann¹, ¹Brown Loam Branch Experiment Station, Raymond, Mississippi, ²Mississippi State University, Mississippi State, Mississippi.

Age and weight are common criteria used to estimate an appropriate time to breed in beef heifers. Repartitioning of fat may also influence reproductive efficiency in relation to response to estrous synchronization and fertility at first breeding. The objectives of this study were to determine whether fluctuations in percent intramuscular fat (%IMF) may occur in relation to estrous synchronization method and stage of the estrous cycle, and whether there is a relationship between %IMF and pregnancy rate. Experiment (EXP) I: Angus beef heifers ($n = 20$) were synchronized using a two-injection PGF_{2a} (PG; 25mg, i.m.) regimen. Following the second injection of PG and detection of estrus, real-time ultrasound (RTU) was performed to assess live animal carcass traits and blood samples collected on d 3, 9, and 15 post-estrus. Measurements by RTU consisted of %IMF of the Longissimus muscle at the 11, 12 and 13th ribs, %IMF Stress Score, back fat thickness (BF), rump fat thickness (RF) and gluteus medius depth (GMD). Following a return to estrus 21.2 ± 0.33 d later, measurements were repeated again on d 3, 9, and 15 post-estrus of the next estrous cycle. Blood samples were analyzed for serum concentrations of progesterone and estradiol by RIA. EXP II: Crossbred beef heifers ($n = 78$) were assigned to one of two estrous synchronization groups: oral MGA/PG (0.5 mg MGA/head/day) or two-injection PG. Measurements were consistent with those described in EXP I, with measurements taken at the start (d -14), middle (d -7) and end (d 0) of estrous synchronization, and on d 7 and 14 post-estrus and AI. EXP I: %IMF was negatively correlated to IMF stress score (-0.48, $P < 0.0001$). However, %IMF and IMF stress scores did not differ ($P > 0.10$) relative to overall stage of the estrous cycle. Similarly, BF, RF and GMD did not differ ($P > 0.10$) relative to stage of the estrous cycle over two consecutive estrous cycles (45d). EXP II: Pregnancy rates did not differ ($P > 0.10$) between the synchronization groups (MGA/PG: 56.4%; PG: 53.1%). No difference ($P > 0.10$) in %IMF between MGA and PG groups were recorded at breeding or in relation to first service pregnancy rates. In summary, %IMF did not fluctuate in beef heifers in relation to stage of the estrous cycle and %IMF on the day of breeding did not affect pregnancy rates.

Key Words: Intramuscular Fat, Heifers, Estrous Cycle

62 Single versus split dose of PGF_{2a} in a GnRH + PGF_{2a} protocol combined with melengestrol acetate (MGA) in lactating *Bos taurus* x *Bos indicus* cows. G. E. Portillo*, G. A. Bridges, M. K. Shaw, J. W. de Araujo, W. W. Thatcher, and J. V. Yelich, *University of Florida, Gainesville.*

Lactating *Bos taurus* x *Bos indicus* cows ($n = 304$) were used to evaluate effectiveness of a single versus a split dose of PGF_{2a} in a GnRH/PGF_{2a} protocol. On d 0 of the experiment all cows received 100 μ g GnRH and 7 d later half the cows received either 25 mg PGF_{2a} (LUTALYSE® Sterile Solution) on d 7 or 12.5 mg PGF_{2a} on d 7 and

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

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

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

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

Key Words: PGF2α, GnRH, Synchronization

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

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

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

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

Key Words: Postpartum Beef Cow, Estrus, Luteal Activity

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

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

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

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