

968 Effects of non-Ig proteins on the absorption of IgG from maternal colostrum or bovine serum colostrum supplement in neonatal Holstein calves. D. F. Davenport*, J. E. Martin, J. D. Quigley, III, and J. Holt, *University of Tennessee, Knoxville*.

Calves are born hypogammaglobulinemic and rely on Ig from colostrum to obtain passive immunity. In previous research, milk based colostrum supplements were less effective than maternal colostrum in providing adequate IgG to neonatal calves. Our objective was to determine absorption of IgG in newborn calves fed a USDA food grade bovine serum derived colostrum supplement (CS; American Protein Corporation, Ames, IA), pooled maternal colostrum (MC), CS with 200 g casein (C200), 400 g casein (C400), 200 g whey (W200), or 400 g whey (W400). Holstein calves (n = 48) were removed from the dam within 0.5 h of birth and housed in individual stalls for the 24 h study. Calves were fed 4 L of MC, CS, or CS with added protein at 1.5 h. Calves were blocked by time. Jugular blood was collected at 1 and 24 h and analyzed for IgG by radial immunodiffusion, hematocrit, and total plasma protein. At 24 h calves were injected with 1.5 ml of Evans blue dye for estimation of plasma volume. Mean plasma IgG at 24 h of age was 6.14 g/L and was affected by block ($P < 0.0001$) and treatment ($P < 0.005$). Mean plasma IgG at 24 h were 5.64, 5.54, 3.74, 6.81, 7.15, and 7.92 g/L for calves fed CS, C200, C400, W200, W400, and MC respectively. Plasma IgG was greater in calves fed MC than CS and tended to be higher in calves fed C200 versus C400. Apparent efficiencies of IgG absorption (AEA) at 24 h were 43, 41, 27, 53, 53, and 59% and tended to be reduced in calves fed C400. Data suggests that additional whey did not affect absorption of IgG from CS, but 400 g of casein reduced IgG absorption of CS. AEA was greater for MC than CS ($P < 0.04$), tended to be higher for C200 than C400 ($P < 0.07$), and was numerically higher for the whey treatments than the CS alone ($P < 0.12$).

Key Words: Calves, Colostrum, Immunoglobulins

969 Comparison of serum derived IgG versus milk derived IgG supplements on the attainment of passive transfer of immunity in newborn calves. J. D. Arthington*¹ and M. B. Cattell², ¹American Protein Corporation, Ames, IA, ²Research Technologies, Inc., Loveland, CO.

Recent research has reported on the unique ability of bovine serum immunoglobulin-G (IgG) to absorb with an efficacy equal to natural colostrum. This study was designed to compare the absorptive efficiency of IgG from bovine serum (LifeLineTM), cow colostrum (positive control), and two commercial milk derived IgG supplements (Supplement 1 and Supplement 2). Newborn Holstein calves, collected at birth and prior to the consumption of colostrum, were alternately allotted to treatment. Each treatment was fed according to manufacturer's recommendations at birth and again at 12 h. This strategy resulted in varying masses of IgG being offered to the calves (90, 60, and 50 g of IgG for LifeLine, Supplement 1, and Supplement 2, respectively). Positive control calves were offered high-quality colostrum, which delivered 100 g of IgG at birth and again at 12 h. Blood samples were collected at 24 h following the administration of treatments. Using birth weight and 24 h blood IgG concentrations, apparent efficiency of absorption was determined by estimating total blood volume of individual calves. Resulting 24 h blood IgG concentrations differed ($P < .01$) for each treatment (12.1, 6.8, 3.5, and 2.2 mg IgG / mL for Colostrum, LifeLine, Supplement 1, and Supplement 2, respectively). Apparent efficiency of IgG absorption was greatest for LifeLine ($P < .05$) compared to Colostrum and Supplement 2. No treatment differences were detected on the occurrence of mortality. However, LifeLine calves tended ($P < .07$) to have fewer treatments for illness compared to Colostrum and Supplement 2 calves. In conclusion, it appears that both the mass and source of IgG impacts the ability to achieve adequate passive transfer. Calves receiving LifeLine experienced improved IgG absorption efficiency and decreased number of treatments compared to calves consuming cow's colostrum or a dried colostrum product.

Key Words: Serum Protein, IgG, Colostrum

970 Effects of freezing on absorption of colostral leukocytes and response to oral challenge with *Escherichia coli* in lambs. J. D. Quigley* and K. R. Martin, *University of Tennessee, Knoxville*.

Effects of fresh or frozen and thawed colostrum on acquisition of passive immunity and absorption of colostral leukocytes was evaluated using 16 newborn lambs. Eight sets of twins were fed colostrum from the ewe at 3.3 and 15.4 h of age. Colostrum was obtained from the ewe and divided into two equal portions. One portion was frozen in liquid nitrogen and then thawed in a water bath to reduce colostral leukocyte viability. The second portion was held at approximately 39°C in a water bath. Four sets of twins were orally inoculated with 3×10^8 to 10^{11} cfu of enterotoxigenic *Escherichia coli* at 24 h of age. Blood was sampled at 0 h, 24 h, 7 d and 14 d for analysis of IgG, total leukocytes and differential counts and blood volume. Colostral leukocytes (1.9×10^6 cells/ml) were composed of 75.4% neutrophils, 8.3% lymphocytes, and 16.3% macrophages. Freezing and thawing reduced cell viability from 43.1% to 10.1%. Plasma IgG was unaffected by treatment and was 21.0, 15.2 and 14.4 g/L at 1, 7 and 14 d of age, respectively. Freezing and thawing colostrum and *E. coli* inoculation had no effect on absorption of colostral leukocytes, fecal scores, respiration, rectal temperatures, fecal coliform excretion, intake of milk replacer or calf starter or plasma volume, plasma leukocytes, or plasma differential counts. Shedding of K99+ *E. coli* was increased and BW gain from 7 to 14 d was decreased when lambs were inoculated with *E. coli*. Results of this study suggest that resistance to *E. coli* challenge was mediated primarily through Ig absorption.

Key Words: Lambs, Colostrum, Leukocytes

971 A microcomputer simulation to evaluate management strategies for rearing dairy replacements. G. L. Bethard*², M. L. McGilliard¹, and R. E. James¹, ¹Virginia Polytechnic Institute and State University, Blacksburg, ²New Mexico State University, Las Cruces.

A microcomputer simulation using a spreadsheet was developed to analyze the dairy replacement enterprise. The simulation predicted BW, DMI, and fixed and variable costs for each week of a heifer's life from birth to calving under confinement conditions. Milk yield, feed costs, and fixed costs were predicted for first lactation. The simulation was used to analyze profitability of various growth rate scenarios and estimate marginal costs associated with changing feed costs, heat detection efficiency, death loss, and abortion rate. Six growth scenarios were evaluated: 1) normal growth from 5 wk to calving, 2) accelerated growth from 5 wk to calving, 3) slow growth from 5 wk to calving, 4) normal growth from 5 wk to 14 mo and accelerated growth from 14 mo to calving, 5) accelerated growth from 5 wk to 14 mo and control growth from 14 mo to calving, and 6) slow growth from 5 wk to 14 mo and accelerated growth from 14 mo to calving. Average daily gain from birth to calving was 0.78, 0.90, 0.62, 0.78, 0.75, and 0.80 kg/d, and age at calving was 25.1, 23.1, 27.4, 23.1, 23.0, and 23.1 mo, respectively. Total rearing cost (fixed and variable) from birth to calving was 1246, 1220, 1275, 1148, 1148, and 1138 \$/heifer, and net profit through first lactation was 399, 407, 319, 441, 432, and 463 \$/heifer, respectively. Increasing feed costs, death loss from birth through weaning, or abortion rate one percentage point increased rearing costs 7.33, 2.40, and 9.10 \$/heifer. Improving heat detection efficiency one percentage point reduced rearing costs \$2.80/heifer. Total rearing costs increased by \$73.49 per additional month to first calving between 24 and 26 mo. Profit in this simulated confinement operation was maximized at early calving (24 mo) and modest rates of growth (0.75 to 0.80 kg/d).

Key Words: Heifer, Simulation

972 Timing of insemination for heifers identified in estrus by a radiotelemetric estrus detection system. R. L. Nebel*, S. M. Jobst, and M. B. G. Dransfield, *Virginia Polytechnic Institute and State University, Blacksburg.*

Optimal time of AI was determined from services (n = 434) performed in herds (n=3) utilizing a radiotelemetric estrus detection system with potential for continuous 24 h surveillance to monitor behavioral events associated with estrus. The system (HeatWatch[®]) consisted of pressure-sensitive radio frequency transmitters affixed over the sacral region of heifers. Activation of the sensor sent a radiotelemetric signal to a microcomputer via a fixed antenna. Heifer identification, date, time, and duration of each standing event were recorded in the software program provided with the system. Each farm selected a 3-h interval to inseminate heifers identified in estrus during the previous 24 h. Time of AI was recorded by the inseminator, and return to estrus information and mounting activity data were retrieved from HeatWatch[®] software. Pregnancy status was determined by return to estrus data and palpation of the uterus 35 to 75 d following AI. Standing events during estrus averaged 28 ± 17.9 per Jersey and 16.3 ± 11.6 per Holstein heifer. Duration of estrus ranged from 12.8 ± 6.0 h per Jersey heifer to 10.3 ± 5.9 h per Holstein heifer. There were no differences in the circadian distribution of onset of estrus grouped by four 6-h periods. Mean pregnancy rate for Jersey heifers was 63.3% and 65.1% for Holstein heifers. Time from first standing event to AI affected probability of pregnancy ($P < .05$), with highest pregnancy percentages for services occurring between 0 and 16 h after onset of standing activity. Mean pregnancy rate during the time interval from 0 to 16 h after onset of standing activity was 68.7% (n=316) compared with 59.7% for services between 16 and 20 h (n=67) and 47.1% (n=51) for services performed > 20 h after onset of standing activity. Results from this study suggest that if onset of estrus is unknown, AI should be performed soon (within hours) after observation of estrus.

Key Words: Artificial Insemination, Detection of Estrus, HeatWatch[®]

973 An optimization model to support dairy heifer management decisions. M. C. M. Mourits¹*, R. B. M. Huirne¹, A. A. Dijkhuizen¹, and D. T. Galligan², ¹Wageningen Agricultural University, The Netherlands, ²University of Pennsylvania.

A dynamic programming model is developed to optimize rearing strategies for dairy heifers. Heifer rearing is modeled as a separate farming activity; the model starts with new born calves and ends with full grown pregnant heifers to be sold at market prices. The model optimizes management decisions with respect to growth, insemination and replacement under maximization of the total present value of expected net returns per heifer per year. The rearing problem is structured with time (1 mo) as stage variable and 5 levels of weight gain (0.3, 0.5, 0.7, 0.9, and 1.1 kg/d). In the model, heifers are described in terms of age, season of birth, body weight, reproductive state and prepubertal growth level. In this way, the model contains more than 600,000 states, which a heifer may enter during her rearing period. For each combination of body weight and growth rate, a least cost ration is determined. Seasonal feed prices, quality and availability as well as seasonal market prices and slaughter values are based on conditions observed in the Netherlands. Optimal rearing strategy results in an average calving weight of 563 kg at an average calving age of 22.3 months. Average discounted net returns equal \$204 per heifer per year. Season of birth does not greatly influence the optimal rearing policy; average calving age varies from 22.1 to 22.5 months. Economic results are more sensitive to seasonal influences. Highest income is obtained from heifers born in December (\$228) whereas those born in June yield the lowest (\$169). Sensitivity analyses are carried out to provide insight into the influences of price and production variables on the technical and economic results. Information on these sensitivities is important, since a thorough understanding and knowledge of the critical components within heifer rearing is currently lacking. The model is intended to be used as a decision support tool for individual farmers, and will also be modified from Dutch to US (i.e., Pennsylvania) conditions.

Key Words: Heifer Rearing, Management Model

974 Application of the Cornell Nutrient Management Planning System. T. P. Tylutki*, C. D. Bannon, D. G. Fox, and S. D. Klausner, *Cornell University, Ithaca, NY.*

The Cornell Nutrient Management Planning System is an integrated suite of software comprised of: 1) The Mass Nutrient Balance, 2) The Cornell Net Carbohydrate and Protein System (CNCPS), 3) The Crop Nutrient Management Planning System, and 4) The Crop Rotation Planning System. The Mass Nutrient Balance program estimates the amount of N, P, and K entering the farm (as feed, fertilizer, N fixation, and cattle) and leaving the farm (as meat, milk and crops sold). The CNCPS was modified to predict N, P, and K excretion in feces and urine, total manure production, and annual feed requirements. The Crop Nutrient Management Planning System is a manure management tool. Farm specific evaluations of hydrologic risks and soil properties are used to predict the optimum time of year for manure application to prevent runoff and conserve nutrients for crop production. Rates per acre of manure are calculated by determining the crop nutrient requirements (by soil testing), analyzing the nutrient content of the farm's manure, and estimating the nutrient availability of the manure. The Crop Rotation Planning System estimates the most efficient rotation for meeting the herds dry matter requirements and utilizing manure nutrients. The CNMPS was used on a case-study farm (500 cows) to design a new feeding and cropping program to: minimize purchased feeds and nutrient imports, and reduce costs while maintaining or improving milk production. Intensively managed grass was substituted for corn on the wet, erodable hillsides, and a feeding program was designed to utilize high quality grass forage. Milk production remains constant but feed costs are decreased \$40,000 annually. The percent of the ration that is home raised is increased to 78% (from 46%), reducing purchased N, P, and K 55, 48, and 82%, respectively. In the new cropping plan, only the flat valley land is rotated with corn and alfalfa, and acres seeded each year are reduced 22% by this change. This case-study demonstrated how the CNMPS can be used to improve dairy farm sustainability from an environmental and profitability viewpoint.

Key Words: Knowledge Integration, Nutrient Management, Models

975 The effect of rumen protected methionine on milk production and milk composition in first lactation Holstein cows. J. D. Ferguson*, B. Vecchiarelli, J. Beach, and S. Takenaka, *University of Pennsylvania, School of Veterinary Medicine, Kennett Square, and Nisso America, Inc., New York, NY.*

Fifty four first lactation animals were randomly assigned to one of two precalving diets and one of two postcalving diets. Precalving diets were designed to contain 14% CP with 33% UIPIP and 1.56 kcal/kg NeL. One group of animals received a top dress of .45 kg of GEC containing 20 g of rumen protected methionine (RPMET, Met-Plus[®]) and the other group received a top dress of .45 kg of GEC alone. All other ration ingredients were mixed together in a TMR and offered once a day to 10% feed refusal. Animals were fed the precalving diets for 21 to 60 days prior to calving. At calving, cows were randomly assigned to diets containing 16% CP, 38% UIPIP and a NeL of 1.72 kcal/kg. One group of animals received a top dress of .45 kg of GEC containing 20 g of RPMET and the other group received a top dress of .45 kg of GEC alone. Treatments were continued through 100 days post calving. Feed intake was measured daily for each group of 10 animals. Milk production was measured twice daily, a.m. and p.m. Body weight and body condition score were measured weekly. Once a week, milk samples from a.m. and p.m. milkings were composited, preserved with bronopol, and analyzed for fat, crude protein (CP, %), true protein (TP, %), and milk urea nitrogen (MUN, mg/dl), by the PA DHIA milk testing laboratory, University Park, PA. Results were as follows: Values (sem) with different superscripts in same column differ by $p < .10$.

Dietary treatments	Milk, kg	Fat, %	CP, %	TP, %	MUN, mg/dl
Dry Period -					
Lactating Period					
RPMET -					
RPMET	33.2 ^a (.47)	3.62 (.04)	3.13 ^a (.02)	2.97 (.01)	12.46 (.19)
No - No	31.2 ^b (.61)	3.63 (.05)	3.08 ^b (.02)	2.93 (.01)	12.53 (.17)
RP-MET -					
No	29.6 ^c (.50)	3.76 (.04)	3.00 ^c (.02)	2.92 (.01)	11.20 (.18)
No -					
RP-MET	31.1 ^b (.50)	3.87 (.04)	3.17 ^a (.02)	3.01 (.02)	11.40 (.23)

RP-MET enhanced milk production and milk CP when fed in lactating diets. Feeding prior to calving seemed to hasten the milk response.

Key Words: Methionine, Milk Production, Dairy Cattle

976 Effect of level and degradability of dietary protein on the performance of lactating dairy cows. J. E. Shirley*, D. Piehl, and E. C. Titgemeyer, *Kansas State University, Manhattan.*

Fifty-six Holstein cows were utilized to evaluate expeller soybean meal (ESBM) as a source of rumen undegradable intake protein (RUP). Cows were fed similarly for the first 28 days postpartum then assigned to one of the following diets: 18% crude protein (CP), 35% RUP; 16% CP, 35% RUP; 16% CP, 40% RUP using ESBM; 16% CP, 40% RUP using a blood meal:meat and bone meal blend (BM/MBM). Diets with 35% RUP contained solvent soybean meal as the primary protein supplement. Dietary fat was equalized with tallow. Treatment groups were balanced for parity, milk yield and body condition based on pretreatment performance. Dry matter intake and milk yield and components were similar for cows fed diets containing 18% and 16% CP and 35% RUP. Milk yield from cows fed diets containing 40% RUP was numerically higher than from cows fed 35% RUP diets. Milk fat % was higher ($P < .05$) in milk from cows fed ESBM relative to cows fed BM/MBM, but similar to cows fed 35% RUP diets. Milk protein % was lower in milk from cows fed ESBM relative to cows fed BM/MBM ($P < .01$) or fed 35% RUP diets ($P < .05$). Plasma amino acids were lower ($P < .01$) in cows fed the 16% CP, 35% RUP diet compared to cows fed the 40% RUP diets but were similar to cows fed the 18% CP, 35% RUP diet. Plasma urea nitrogen was highest ($P < .01$) in cows fed the 18% CP, 35% RUP diet, lowest ($P < .01$) in cows fed BM/MBM, and similar between cows fed ESBM and the 16% CP, 35% RUP diet.

Key Words: Dairy, Protein, RUP

977 Summary of trials conducted evaluating the effect of a combination of complexed zinc methionine, manganese methionine, copper lysine and cobalt glucoheptonate on lactation and reproductive performance of dairy cattle. M. T. Socha* and A. B. Johnson, *ZINPRO Corporation, Eden Prairie, MN.*

The objective of this review was to summarize the five trials conducted evaluating the effect of feeding a combination of complexed zinc methionine, manganese methionine, copper lysine and cobalt glucoheptonate (4-PLEX[®], ZINPRO Corporation, Eden Prairie, Minnesota) on reproductive and lactation performance of dairy cattle. In all five trials, cows consumed 360 mg of zinc/head/d from zinc methionine complex, 200 mg of manganese/head/d from manganese methionine complex, 125 mg of copper/head/d from copper lysine complex and 25 mg of cobalt/head/d from cobalt glucoheptonate. Cows also received additional zinc, manganese, copper and cobalt from inorganic sources. In three studies, the control and treatment diets contained an equivalent amount of zinc, manganese, copper and cobalt. In three studies, the control and treatment diets contained an equivalent amount of zinc from zinc methionine complex. Four trials were conducted in conjunction with University personnel and the fifth trial was conducted in conjunction with a private consultant. Each trial was a block and each treatment mean within a trial was treated as an observation. Cows fed a combination of complexed zinc methionine, manganese methionine, copper lysine and cobalt glucoheptonate produced more ($P < 0.05$) milk (35.8 vs. 34.4 kg/d), energy-corrected milk (36.2 vs. 34.7 kg/d), 3.5% fat-corrected milk (36.1 vs. 34.5 kg/d) and milk protein (1.12 vs. 1.08 kg/d) than cows not fed a combination of complexed trace minerals. Cows fed a combination of complexed zinc methionine, manganese methionine, copper lysine and cobalt glucoheptonate also had fewer ($P < 0.05$) days to first service (70 vs. 78 d) and tended to have fewer ($P < 0.10$) days open (118 vs. 133 d). This summary of five dairy trials indicates that feeding a combination of complexed zinc methionine, manganese methionine, copper lysine and cobalt glucoheptonate increases lactation and reproductive performance of dairy cattle.

Key Words: Complexed Trace Minerals, Lactating Dairy Cows, Reproduction

978 The influence of maize silage maturity on forage intake and milk production of Friesian-Holstein dairy cows in the United Kingdom. R. H. Phipps*, J. D. Sutton, and D. E. Beever, *Centre for Dairy Research, The University of Reading, Reading RG2 9HX, United Kingdom.*

Fifty-four multiparous Friesian-Holstein cows were used in a 20-week trial to examine the effect of maize silage maturity on feed intake and milk production. At week 3 of lactation cows were allocated to five forage treatments; grass silage (T1) or a mixture of maize and grass silage (3:1 DM ratio). The DM content of maize silages used in T2-T5 was 226, 290, 302, and 390 g/kg. The starch, neutral detergent fibre (NDF), and metabolisable energy (ME) values of the maize silages used in T2-T5 were 114, 274, 309 and 354 g/kg DM, 574, 447, 431 and 448 g/kg DM, and 10.3, 11.5, 11.6 and 11.2 MJ/kg DM. All cows received 10 kg/d fresh weight of concentrate. For treatments T1-T5, respective means and s.e.d. were 9.2, 10.9, 13.3, 13.1 and 12.8 (0.58) kg/d for forage DM intake, 28.0, 29.4, 32.7, 33.0 and 30.8 (1.04) kg/d for milk yield, 45.0, 45.8, 43.3, 41.8 and 44.6 (0.15) g/kg for milk fat content and 30.6, 32.4, 32.7, 31.9 and 31.9 (0.06) g/kg for milk protein content, while the corresponding values for yield of milk fat and protein were 1275, 1355, 1424, 1387 and 1384 (60.5) g/d and 863, 953, 1060, 1055 and 985 (28.8) g/d. Including maize silage in a grass silage based diet increased ($P < 0.001$) forage DM intake and ($P < 0.05$) milk yield. Increasing maize silage DM content from 226 to 290 g/kg increased ($P < 0.05$) forage DM intake from 10.9 to 13.3 kg/d, but a further increase to 390 g/kg reduced ($P < 0.10$) it to 12.8 kg/d. Milk yield was reduced ($P < 0.05$) when maize silage DM content increased from 302 to 390 g/kg. Increased maize maturity tended to reduce milk fat content. Including maize silage increased ($P < 0.001$) content and yield of milk protein. Increasing maize silage DM content from 290 to 390 g/kg decreased ($P < 0.05$) milk protein content and yield from 32.7 to 31.9 g/kg and 1060 to 985 g/d.

Key Words: Maize Silage, Maturity, Milk Production

979 Parturition photoperiod and melatonin feeding on milk production and prolactin concentrations of dairy heifers and cows. D. Petitclerc*, C. M. Vinet, G. Roy, and P. Lacasse, *Agriculture and Agri-Food Canada, Dairy and Swine R & D Centre, Lennoxville (Québec), Canada.*

Holstein multiparous cows ($n = 33$) and primiparous heifers ($n = 29$) calving over a one year period were subjected to photoperiod-melatonin treatments according to a 2×3 factorial design. Starting 8 wk prior to expected calving, all animals were subjected to one of the following treatments: 8 h of light(L):16 h of dark (D), 16L:8D or 16L:8D plus melatonin feeding. Animals subjected to melatonin treatment were exposed to 16L:8D but received orally at 15h55 a gelatin capsule containing 25 mg of melatonin (16L:8D-melatonin). Treatments ended at calving when animals were moved to the lactating barn; all animals were then subjected to about 16 h of light per day. At the beginning and at the end of the treatment period prior to calving, 4 heifers and 4 cows were sampled thru a jugular canulae for 24 h at 30-min intervals to monitor serum melatonin and prolactin concentrations. Melatonin concentrations averaged 264.4^a, 212.0^a and 499.5^b pg/ml at the beginning ($P < 0.001$) and 292.7^a, 185.0^b and 453.0^c pg/ml at the end ($P < 0.001$) of the treatment period for animals subjected to 8L:16D, 16L:8D or 16L:8D-melatonin treatments, respectively. Prolactin concentrations were not significantly different at the beginning of the treatment period but were different ($P < 0.01$) in animals subjected to 8L:16D, 16L:8D or 16L:8D-melatonin just prior to calving (7.7^a, 15.2^b and 9.7^a ng/ml, respectively). Milk production averaged 30.8^a, 29.0^b and 28.8^b kg/d ($P = 0.03$) for the first 16 weeks of lactation and 27.5^a, 26.3^b and 25.4^b kg/d ($P = 0.07$) over 40 weeks of lactation in cows subjected to 8L:16D, 16L:8D or 16L:8D-melatonin treatments, respectively. There was no treatment effect on feed intake ($P > 0.25$). In conclusion, long-day photoperiod is a positive signal that will increase milk production of dairy cows if a switch from short to long-day is given at the time of calving. However, melatonin cannot be used to mimic short-day photoperiod during the dry period.

Key Words: Cattle, Photoperiod, Milk Yield

980 Enhancing reproductive performance in sows with post-partum prostaglandin (PGF_{2α}) therapy. C. Okere*, R. R. Hacker, and V. R. Osborne, *University of Guelph, Ontario, Canada.*

An experiment was conducted to evaluate the effect of a single injection of prostaglandin F_{2α} (LUTALYSE Pharmacia & Upjohn) administered post-partum to sows on litter performance and progesterone profiles. Pregnant Yorkshire sows were divided randomly into two groups of 51 (T vs C). Treated sows received a single i.m. injection of 2 mL LUTALYSE (10 mg PGF_{2α} 24–48 h post-farrowing. Body weight changes from breeding were recorded for sows on gestation day 109 and lactation d 1, 7, 14 and 21. Piglets were weighed on d 1, 7, 14 and at weaning (d 21) of age. Milk yield of each sow was estimated by weigh-suckle-weigh methods on d 7, 14 and 21 of lactation. Sows were blood sampled on gestation d 109 and lactation d 1, 3, 7 and 14 for progesterone assay using RIA. All sows were weaned on d 21 of lactation and re-bred on first post-weaned heat. The number of pigs born (total, live) was similar (9.00 vs 8.33, P=0.30 and 8.18 vs 8.00, P=0.78) for sows in the treatment and control groups. Treated sows showed numeric improvement in the number of piglets weaned (7.42 vs 6.85). There were no differences in sow weights at breeding (d 0) or gestation d 109 (153.06 vs 147.74 kg, P=0.18) and (193.96 vs 190.29 kg, P=0.36). Weaning weights for sows were also similar (172.30 vs 171.55 kg, P=0.79). Mean milk consumption for control piglets was estimated as 717.33 vs 751.23 g/pig/d. Piglet weights at birth, on lactation days 7 and 14 were similar (1.39 vs 1.42, P=0.39; 2.58 vs 2.73, P=0.12 and 4.17 vs 4.31 kg, P=0.39). At weaning, mean body weights were 5.84 vs 5.82 kg, P=0.84). Analysis of sow serum progesterone levels indicated no significant differences attributable to treatment (0.97 vs 0.91, P=0.38; 0.87 vs 0.94, P=0.31 and 0.82 vs 0.93 ng/mL, P=0.11) on lactation d 3, 7 and 14. Pre-treatment serum levels of 9.33 vs 9.38, P=0.94 and 5.36 vs 5.01 ng/mL, P=0.74 were recorded for gestation d 109 and lactation d 1. The study demonstrates numeric improvements in the number of piglets weaned, milk yield per sow and a more rapid decline in postparturient serum progesterone levels in PGF_{2α} treated sows.

Key Words: PGF_{2α}, Reproduction, Sows

981 The effect of androstenedione immunization on estrus and ovulation in gilts. C. Okere* and R. R. Hacker, *University of Guelph, Ontario, Canada.*

Previous studies tend to suggest that immunizing gilts against ovarian steroid androstenedione resulted in increases in ovulation rate and peripheral concentrations of progesterone and LH. To confirm these preliminary results thirty pre-pubertal Yorkshire gilts were assigned randomly to two groups (C vs T). Gilts each received one i.m. injection of 4 mg bovine serum albumin dissolved in saline (2 mg/mL) and in lyophilized Quil-A (1:1 v/v, 4 mL) (C=15) or androstenedione 11α-hemisuccinyl bovine serum albumin (4 mg AND-BSA, T=15) respectively at approximately 100 d of age. Booster immunizations with appropriate conjugates were given at d 121 of age. At d 140 gilts were relocated and checked for estrus with boars daily. Signs of estrus were rated as 3 (standing heat), 2 (swollen vulva and almost standing), 1 (slight swelling of vulva) or 0 (no indication of heat). Blood samples were collected from each gilt twice weekly and assayed for progesterone by RIA. Gilts were slaughtered midway through their second estrus cycle, the reproductive tracts were removed, weighed and examined. Mean age and weight at first injection were 100.30±1.0 vs 97.10±3 d and 67.30±3.0 vs 69.40±3.0 kg for C and T respectively. Age at first estrus and estrus rating were similar (179.20±5.0 vs 182.10±6.1 d and 1.70±0.7 vs 1.80±0.8 (P>0.05). The number of ovarian structures (ovarian follicles >4 mm, corpora albicantia and corpora lutea) were also similar (14.30±1.3 vs 15.50±1.7, 9.30±0.8 vs 9.50±0.9 and 12.20±0.7 vs 12.40±0.6, P>0.05). Uterine weights did not differ between both groups (0.79±0.05 vs 0.77±0.05 kg, P>0.05). Ovulation rate tended to increase from first to second ovulation by approximately 2.5 ovulations. Data from progesterone assay conclusively demonstrated that all gilts slaughtered were cycling normally and could have been successfully mated. These results indicate that active immunization against androstenedione caused inconsistent increases in ovulation rates of pubertal gilts as judged from the number of CL. Also, immunization of gilts failed to advance the age at puberty.

Key Words: Immunization, Androstenedione, Gilts

982 Effect of tylosin phosphate (Tylan®) on weight gains, feed efficiency, and carcass measurements in finishing swine in the presence of acute Mycoplasma pneumonia. G. A. Armbruster*¹, R. C. Thaler², P. M. Swantek³, M. J. Marchello³, and W. C. Weldon¹, ¹Elanco Animal Health, Indianapolis, IN, ²South Dakota State University, Brookings, ³North Dakota State University, Fargo.

An experiment was conducted to evaluate the effect of tylosin phosphate (Tylan®) on carcass composition and growth performance when pigs were fed two levels of lysine. Barrows averaging 23 kg (n = 140) were assigned in a randomized complete block design to receive either normal dietary lysine or dietary lysine considered to be below their total dietary lysine needs. Pigs also received diets that were either unmedicated or had tylosin added at doses ranging from 110 to 22 ppm. Pigs were fed to minimum slaughter weight of 102 kg and total carcass dissections were performed. At an average age of approximately 19 weeks, the trial pigs experienced unplanned acute pneumonia caused by Mycoplasma hyopneumonia (Mh). The ADG and feed conversion were improved in the tylosin fed pigs 19 (695 vs 585 gms; P = .06) and 10 (4.57 vs 5.12; P = .04) percent respectively from 82 kg to slaughter which included the onset and duration of the acute pneumonia. Tylosin increased (P < .05) the following carcass parameters: fat free lean (40.12 vs 38.37 kg), loin eye area (37.29 vs. 34.29 cm²), trimmed ham (8.73 vs. 8.44 kg), trimmed picnic (3.66 vs 3.46 kg), and trimmed boston butt (2.86 vs 2.74 kg). Tylosin improved (P = 0.055) fat free lean percentage (51.56 vs 49.82). There was (P < .10) a tylosin x lysine level interaction noted in the following trimmed primals: belly, boston butt, and loin as well as 10th rib backfat, fat free lean, and fat free lean percentage. Tylosin improved these traits in the normal lysine but not in the low lysine diets. In summary, tylosin aided in maintaining ADG and feed conversion during late finishing phase in the presence of acute Mh pneumonia. It appears that higher levels of lysine were not beneficial to performance during acute Mh pneumonia. Higher lysine levels and addition of tylosin was beneficial to many of the carcass traits measured.

Key Words: Pigs, Mycoplasma, Tylosin

983 Comparison of real-time and a-mode ultrasound scans for prediction of fat free lean in live pigs and carcasses. S. J. Moeller and R. S. Emmett*, *The Ohio State University, Columbus.*

Real-time (RTU) and A-mode (AU) ultrasound scans were collected on 50 pigs comprising two sexes (29 barrows; 21 gilts) and weighing between 102 and 136 kg live weight. Ultrasound scans were taken on the live (LV) pig and the hot carcass (CAR) following slaughter and exsanguination. Real-time ultrasound scans of backfat (BF) and loin muscle area (LMA) were taken in cross-section on the right side at the tenth (TR) and last (LR) ribs and a longitudinal (LON) backfat scan taken 6.35 cm off the midline and posterior to the TR. A-mode scans for BF were taken at the TR and LR, 6.35 cm off the midline on both sides and averaged. Carcass measurements of BF and LMA were taken on the chilled carcass at the TR. Carcasses were fabricated into fat, bone and lean and fat-free lean obtained by chemical extraction of soft carcass tissues. Regression analysis was used to obtain prediction equations to estimate fat-free lean weight (FFLW) and percentage (FFLP) from LV and CAR ultrasound measurements for each machine. FFLW was predicted more accurately than FFLP in all comparisons. Including LMA in prediction equations increased R² for FFLW, but did not improve prediction of FFLP for RTU taken on carcasses. Measurements taken at the LR resulted in lower R² for live and carcass measurements for both RTU and AU.

Method	Location	Trait	Type	Intercept	Weight ^{a,b}	Fat	R ²	RSD
CAR	TR	FFLW	CAR	4.00	.40 ^a	-4.86	.87	1.71
RTU	TR	FFLW	LV	0.57	.42 ^a	-4.55	.86	1.79
AU	TR	FFLW	LV	-4.78	.46 ^a	-3.88	.68	2.78
LON	TR	FFLW	LV	8.45	.35 ^a	-4.47	.81	2.09
CAR	TR	FFLW	CAR	11.00	.46 ^b	-4.79	.91	1.44
RTU	TR	FFLW	CAR	13.53	.41 ^b	-4.15	.85	1.85
AU	TR	FFLW	CAR	7.73	.47 ^b	-3.49	.60	2.99
LON	TR	FFLW	CAR	13.39	.41 ^b	-4.15	.84	1.91

^a Live Weight

^b Carcass Weight

Key Words: Pigs, Ultrasound, Carcass Composition

984 The effect of supplementary vitamin E and C on fresh and cooked pork quality. V. R. Osborne*, R. R. Hacker, and E. J. Squires, *University of Guelph, Ontario, Canada.*

An experiment was conducted to determine the effect of additional vitamin E and C on the colour, drip-loss of fresh pork and the lipid oxidation of fresh and cooked pork and cooking loss. Eighty-four crossbred market hogs were assigned to either a control (no additional vitamin E or C,) or treatment (400 IU of vitamin E plus 500 mg vitamin C per kilogram of feed) diet. Barrows and gilts were penned separately and fed the diets for two weeks (90 kg to 105 kg of body weight). After a 24 h chill, backs were removed from the carcass and a 48 h drip loss and colour (Minolta Chroma-Meter) measurement were determined on duplicate cores of longissimus. Fresh loin roasts were weighed, cooked to an internal temperature of 74 C and re-weighed and packaged at 4 C under normal retail lighting conditions for analysis at 24h and 144h after cooking. Core samples of the roasts were taken fresh and at 24 h and 144 h after cooking to test for lipid stability (TBARS). Treatment diet had a significant effect on the "a value" scale with a positive shift to red colour (8.86 ± 0.78 , 5.10 ± 0.78 , $p < .001$ for treatment versus control). Drip loss was reduced 7% with treatment but was not significant ($p = .19$). Treatment had no effect on lipid oxidation of fresh and cooked meat from barrows (105 ± 89 , 239 ± 89 , 606 ± 89 and 123 ± 94 , 276 ± 94 , 713 ± 94 , TBAR values for control versus treatment at fresh, 24 and 144 h after cooking respectively). However, there was a significant effect of treatment with the lipid oxidation in gilt meat for the 144 h cooked sample, $p < .05$ (139 ± 94 , 339 ± 94 , 1101 ± 94 and 127 ± 89 , 243 ± 89 , 565 ± 89 , TBAR values for control versus treated gilts for fresh, 24 and 144h cooked meat respectively). There was no effect of treatment on the cooking loss ($12.6\% \pm 1.6$, $14.4\% \pm 1.6$ and $14.3\% \pm 1.55$, $12.1\% \pm 1.6$ for barrow control and treatment and gilt control and treatment respectively) although, gilt meat responded positively. Results of this study demonstrate that vitamin supplementation to enhance pork quality may be more beneficial for gilts than barrows.

Key Words: Vitamin E and C, Pork Quality, Gilt

985 Relationship among weaning-to-estrus interval, estrus duration and litter size in sows. M. N. Corrêa¹, J. C. Deschamps^{*1}, T. Lucia Jr.¹, P. N. M. B. Guimarcês¹, and M. C. Macedo Jr.¹, ¹*Cenbiot - UFPEL, Pelotas, Brasil.*

Short weaning-to-estrus interval (WEI) is usually associated with long estrus duration (ED), and thus occurrence of ovulation later during the estrus. This study had the objective of quantifying the association among WEI, ED, and total and born alive litter size in sows mated by artificial insemination. This study was conducted in 111 F1 (Landrace x Large White) multiparous sows (1, 2 and 3+), weaned after 21 days. Estrus detection started in the first day post-weaning, and it was conducted three times daily (8:30, 15:30 and 22:30 hours). The starting point of the estrus was determined by positive response to both boar exposure and back pressure, whereas the end of the estrus was characterized by negative response to back pressure. The WEI was categorized as: Short, in sows showing estrus at most by 97 hours post-weaning; Intermediate, if the WEI was between 97 and 120 hours; and Long, if the WEI lasted more than 120 hours. The ED was categorized as: Short, if shorter than 60 hours; Intermediate, if within 60 and 69 hours; and Long, when longer than 69 hours. The WEI ranged between 74 to 170 hours, with an average equal to 107 hours, whereas the ED ranged between 15 to 120 hours, with a mean of 65 hours. Differences in litter size across WEI and ED categories were measured through analysis of variance, using the GLM procedure of SAS. According to a linear regression analysis, the estrus duration would be predicted by the equation $ED = 139.18 - 0.69WEI$. Thus, as the WEI increased in length, the ED decreased ($P < .0001$). Total and born alive litter sizes did not differ ($P > .05$) across WEI categories. However, sows having intermediate ED farrowed larger total and born alive litter sizes ($P < 0.05$) than those having either short or long ED. Therefore, both WEI and ED should be accurately measured to optimize mating management, since the efficiency of artificial insemination programs depend on adjusting the time of mating to the occurrence of ovulation.

Key Words: Weaning-to-estrus Interval, Estrus Duration, Swine

986 Effect of poultry by-product meal on performance of weaned Angus bulls. B. J. May*, M. T. Schafer, D. R. Shelby, G. R. Engdahl, and C. B. Scott, *Angelo State University, San Angelo, Texas.*

Twenty-four bulls were used to determine the effect of varying protein sources on performance in a 112-d growth study conducted at the Angelo State University, Management, Instruction and Research Center in San Angelo, Texas. Bulls were blocked by weight and randomly assigned to one of four treatments, with two replications of each treatment. Treatments consisted of grower rations with either (1) cottonseed meal and wheat midds as a control (CON), (2) poultry by-product meal (PBM), (3) poultry by-product meal and wheat midds (PBM:WM), or (4) poultry by-product meal and cottonseed meal (PBM:CSM) as the protein sources. Rations were formulated to be both isonitrogenous (14.0% CP) and isocaloric (Neg 1.15 Mcal/kg). Bull weights were taken every 14 d to adjust feed intake to minimize orts and maintain near ad libitum intake (3.0% BW). Average daily gain over the entire trial was higher ($P < .05$) for bulls fed PBM and PBM:WM than CON and PBM:CSM. In addition, FE over the entire trial was higher ($P < .05$) for bulls fed PBM and PBM:WM than CON and PBM:CSM. Data from this study indicate that growing bulls fed rations containing PBM or PBM:WM as escape protein sources will increase performance over bulls fed nutritionally the same grower rations with cottonseed meal with wheat midds or PBM:CSM as protein sources.

Trait	CON	PBM	PBM:WM	PBM:CSM
ADG (d 1-112)	1.39 ^a	1.54 ^b	1.56 ^b	1.41 ^a
FE (d 1-112)	10.81 ^a	8.82 ^b	8.65 ^b	10.12 ^a

Key Words: Bulls, Performance, Protein

987 Effect of varying protein sources on performance of weaned bulls. R. E. Rea, B. J. May, G. R. Engdahl*, D. R. Shelby, and C. B. Scott, *Angelo State University, San Angelo, Texas.*

Thirty-six bulls were used to determine the effect of varying protein sources on performance in a 112-d growth study conducted at the Angelo State University, Management, Instruction and Research Center in San Angelo, Texas. Bulls were blocked by weight and randomly assigned to one of four treatments, with two replications of each treatment. Treatments consisted of grower rations with either (1) cottonseed meal and wheat midds as a control (CON), (2) fish meal and wheat midds (FM), (3) blood meal and wheat midds (BM), or (4) fish meal, blood meal and wheat midds (FM:BM) as the protein sources. Rations were formulated to be both isonitrogenous (14.0% CP) and isocaloric (Neg 1.15 Mcal/kg). Bull weights were taken every 14 d to adjust feed intake to minimize orts and maintain near ad libitum intake (3.0% BW). From d 1 through d 56 ADG was similar for all treatments; however, over the entire trial gains of bulls fed BM were higher ($P < .05$) than CON and FM. From d 84 to d 112 FE was lower ($P < .05$) for bulls fed FM than for all other treatments; however, there were no significant differences in FE or DMD over the entire trial. Data from this study indicate that growing bulls fed rations containing wheat midds with escape protein sources consisting of BM and a combination of blood meal and fish meal will increase performance over bulls fed nutritionally the same grower rations with cottonseed meal or fish meal as protein sources.

Trait	CON	FM	BM	FM:BM
ADG (d 1-112)	1.52 ^a	1.46 ^a	1.67 ^b	1.58 ^{a,b}
FE (d 1-112)	8.99	10.82	7.83	8.77

Key Words: Bulls, Performance, Protein

988 Application of marketing/sorting regimens to reduce carcass discounts of feedlot cattle. T. J. Klopstein*, R. J. Cooper, and C. T. Milton, *University of Nebraska, Lincoln*.

Feedlot marketing/sorting regimens to reduce overweight (> 432 kg) and overfat (yield grade 4) carcasses were evaluated. Two levels of technology were compared, a subjective estimate of fat depth vs the use of ultrasound for determination of fat depth at reimplant time. The project involved 4348 steers and heifers which were placed in five commercial feedlots in Nebraska. Cattle were randomly split into three treatments: Control (no sorting); Low Tech sort; and High Tech sort. At reimplant time (75–130 d from slaughter), the control pen was processed first, individually weighed, and fat depth estimated. Based on the distribution of the control pen, sort weights and fat depths were determined (calculated as 1.5 SD from the average). Cattle from Low Tech and High Tech treatment pens were then processed, individually weighed, and fat depth determined either by ultrasound (High Tech pen) or by hand palpation over the ribs (Low Tech pen). Cattle in these pens which were heavier than the sort weight and/or fatter than the sort fat depth were identified for Early Sale. The control pen was marketed as a pen when determined by the feedlot manager. Approximately 7–14 d before the control pen was marketed, Early Sale cattle in the High and Low Tech treatment were marketed, while the remainder of the cattle were marketed approximately 7 d after the control pen. This system did not reduce carcass discounts. Fat depth determined at reimplant time was poorly correlated to carcass fat depth. Correlation coefficients for ultrasound fat depth at reimplant time vs carcass fat depth ranged from .09 to .37, while r-values for reimplant weight vs carcass weight ranged from .46 to .86.

	Control	High Tech	Low Tech	P =
Carcass discounts, \$/45 kg	3.65	3.67	3.97	.86
% ≥ yield grade 4	4.3	4.9	6.3	.72
% ≤ 432 kg carcass weight	.1	.3	0.0	.53

Key Words: Feedlot, Marketing, Ultrasound

989 Prewaning performance of Brahman × Angus, Senepol × Angus, and Tuli × Angus cows and their Charolais sired calves with and without a molasses slurry creep. J. R. Skipper¹, A. C. Hammond²*, C. C. Chase, Jr.², T. A. Olson¹, W. E. Kunkle¹, and M. J. Williams², ¹ *University of Florida, Gainesville* ² *USDA, ARS, Brooksville, FL*.

Brahman × Angus (BA, n = 36), Senepol × Angus (SA, n = 28), and Tuli × Angus (TA, n = 40) cows and their Charolais sired calves (CBA, CSA, and CTA, respectively) were used to study the effects of breed and summer creep feeding on cow and calf performance. Cow-calf pairs were stratified by breed and age of calf within breed and assigned to 4 groups (2 treatments and 2 pasture blocks). Treatments were bahiagrass (*Paspalum notatum*) pasture and mineral supplement or bahiagrass and mineral plus ad libitum access to molasses slurry creep. Molasses slurry consisted of 80% blackstrap molasses, 15% soybean meal, and 5% feather meal (DM = 77.9% and CP = 16.8%, DM basis). Cow and calf BW, body condition score (BCS; 1 to 9), and plasma urea nitrogen (PUN) were analyzed at the beginning of the trial on June 18 and at weaning on September 10, 1997. Average slurry consumption was .30 kg·calf⁻¹·d⁻¹. Initial BW and BW at weaning were greater (P < .05) in CBA calves (184 ± 4.5, 260 ± 5.1 kg) than in CSA calves (167 ± 5.1, 244 ± 5.7 kg) and CTA calves (164 ± 4.3, 237 ± 4.8 kg), but there was no effect of breed on ADG (CBA = .90 ± .020, CSA = .92 ± .023, CTA = .87 ± .019 kg/d). Calf BW, ADG, and PUN were not affected by treatment. There was no breed effect on initial PUN in calves, but at weaning PUN was lower (P < .05) in CTA (10.2 ± .25 mg/dL) than in CBA (11.1 ± .26 mg/dL); PUN in CSA (10.8 ± .29 mg/dL) was intermediate. There was no treatment effect on cow BW, BW change, BCS, or BCS change, but BA cows were heavier (P < .01) initially and at weaning (465 ± 7.9, 485 ± 9.0 kg) than TA cows (430 ± 7.3, 446 ± 8.3 kg); SA cows (450 ± 8.6, 468 ± 9.8 kg) were intermediate. Cow BCS tended to be lower (P = .10) at weaning in SA (5.3 ± .18) compared with BA (5.5 ± .16) and TA (5.8 ± .15). Lack of treatment effect on calf ADG and cow BCS change may have been related to relatively good pasture conditions.

Key Words: Beef Cattle, Breeds, Creep Feeding

990 Effects of sire breed, sex, crude protein source, and time on finishing diet (TOF) on longissimus muscle fatty acid and cholesterol content of beef steers. S. K. Duckett¹, S. L. Cuvala^{*1}, T. A. Klein¹, and R. E. Short², ¹ *University of Idaho* and ² *USDA ARS, Miles City, MT*.

The objective of this study was to assess the effects of sire breed (SBREED), sex, crude protein source (CP) and TOF on the longissimus muscle fatty acid and cholesterol content. Calves (n = 120) were sired by either Hereford (H), Limousin (L), or Piedmontese (P) bulls. Both steers (S) and bulls (B) were fed finishing rations with either soybean meal (SBM) or blood meal (BM) as the source of crude protein and slaughtered at two TOF endpoints of 90 or 132 d. Fatty acid composition and cholesterol content of the longissimus muscle were determined by GLC. Data were analyzed using the GLM procedure of SAS with SBREED, sex, CP, and TOF as main effects with all two-, three-, and four-way interactions tested. Total fatty acid content (TFA; g/100g) of the muscle was higher (P < .05) for S than B. Increasing TOF to 132 d increased (P < .05) TFA for H with no change (P > .05) in L or P. Cholesterol content of the longissimus muscle (mg/100g) was also higher (P < .05) for S than B. Saturated fatty acid (SFA) content showed a SBREED*TOF interaction (P < .05) where extending TOF to 132 d increased SFA content in P with no change in H or L. The percentage of odd chain fatty acids was lower (P < .05) for S than B. Monounsaturated fatty acid (MUFA) content differed (P < .05) due to SBREED*sex and sex*TOF interactions. The MUFA content was higher for P-S than P-B but similar between B and S for L and H. Increasing TOF from 90 to 132 d resulted in a higher percent of MUFA for B with no change for S. The percentage of polyunsaturated fatty acids was higher (P < .05) for P than L which was higher (P < .05) than H. In summary, longissimus muscle lipid amounts and composition were influenced by sire breed, sex, and time-on-feed.

Key Words: Beef, Fatty acid, Cholesterol

991 Comparative performance of zebu cattle and water buffaloes in feedlot. M. L. P. Lima*, J. R. Nogueira, and C. H. Gadini, *Instituto de Zootecnia, Ribeirao Preto (Brazil)*.

Zebu cattle and water buffaloes have been used for meat production in tropical regions. The purpose of this study was to compare the performance of zebu cattle and water buffaloes in feedlot. Six Nellore (*Bos indicus*), twelve Jaffarabadi (*Bubalus bubalis*), and twelve Mediterranean (*Bubalus bubalis*), intact males, summer born (February and March), raised in tropical conditions in Brazil (20°55'S latitude/51°23'W longitude) were stocked in pastures for 18 months and feedlot finished in individual pens for 84d, from the end of winter to beginning of spring (average minimum temperature = 16.8 °C and average maximum temperature = 31.3 °C). Initial weights averaged 276.2, 353.0, and 352.8 for Nellore, Jaffarabadi and Mediterranean, respectively. Animals were fed with corn silage (60%), corn (31.3%) and cottonseed meal (8.7%), resulting in a diet with 12% crude protein and 74% TDN. Initial weights were used as covariable in the analysis to compare breed performance. Average daily gain (ADG), dry matter intake (DMI), dry matter intake per 100 kg body weight (DMI%), and gain efficiency given by ADG÷DMI are presented:

Trait	Nellore	Jaffarabadi	Mediterranean
ADG(kg)	1.474(0.099)	1.110(0.051)	1.033(0.050)
DMI(kg/day)	8.69 (0.419)	8.38 (0.214)	8.40 (0.215)
DMI%	2.26 (0.099)	2.19 (0.051)	2.20 (0.051)
Gain efficiency	0.172(0.008)	0.132(0.004)	0.123(0.004)

Standard deviations are in parenthesis

Contrasts between the performance of Nellore and water buffaloes were significant (P<.001) for ADG and Gain efficiency. Did not have difference among the water buffaloes. After 84 days in feedlot, body weights averaged respectively 376 kg, 476, and 450 for Nellore, Jaffarabadi and Mediterranean breeds. Results show that, at the same age, Nellore males are lighter than water buffaloes, but present larger weight gain and better gain efficiency.

Key Words: Dry Matter Intake, Gain Efficiency, Weight Gain

992 Economic design of control charts for monitoring feed production processes. N. St-Pierre and A. Kauffman*, *The Ohio State University, Columbus.*

The basic control chart consists of sampling from a process over time and charting process measurements. For as long as the measurements fall inside control limits (L), the process is considered in-control. In feed production, it is customary to set the control limits at two standard deviations. This practice does not consider the probability of both Type I and Type II errors in addition to all the costs incurred. The objective of this research was to derive a general methodology to determine optimum sample size (n), sampling period (h), and location of L for an X chart used to monitor feed production processes. A quality cycle is defined as the time between the start of successive in-control periods. Let A1 be the average production length while in-control and A2 when the process has shifted to an out-of-control state. The total cost of quality is given by $C = \{C_0/\lambda + C_1(-t + nE + h(A_2) + \delta_1 T_1 + \delta_2 T_2) + sY/A_1 + W\} \div \{1/\lambda + (1-\delta_1)sT_0/A_1 - t + nE + h(A_2) + T_1 + T_2\} + \{[a + bn]/h\} \times [1/\lambda - t + nE + h(A_2) + \delta_1 T_1 + \delta_2 T_2] \div \{1/\lambda + (1-\delta_1)sT_0/A_1 - t + nE + h(A_2) + T_1 + T_2\}$, with $s = \exp(-\lambda h)/(1 - \exp(-\lambda h))$, $t = [1 - (1 + \lambda h)\exp(-\lambda h)]/[\lambda(1 - \exp(-\lambda h))]$, $A_1 = 1/\alpha$, $A_2 = 1/(1 - \beta)$, $\alpha = \Pr(X - CL > L\sigma/\sqrt{n}) + \Pr(X - CL < -L\sigma/\sqrt{n})$, $\beta = \Pr(-L\sigma/\sqrt{n} < X - CL < L\sigma/\sqrt{n})$, where t = expected time of occurrence of the assignable cause, s = expected number of samples taken while in-control, $\lambda = 1/\text{mean time process is in-control}$, E = time to sample and chart one item, T_0 = expected search time when false alarm, T_1 = expected time to discover the assignable cause, T_2 = expected time to repair the process, $\delta_1 = 1$ if production continues during searches, 0 otherwise, $\delta_2 = 1$ if production continues during repair, 0 otherwise, C_0 = quality cost/hour while producing in-control, C_1 = quality cost/hour while producing out-of-control, Y = cost per false alarm, W = cost to locate and repair the assignable cause, a = fixed cost per sample, b = cost per unit sampled. The values n^* , h^* and L^* that give the minimum C provides the optimum control design. The procedure is easily implemented on a modern spreadsheet.

Key Words: Quality Control, Control Chart Design, Feed Production

993 Partially dehulled crambe meal as a protein source for growing and finishing steers. V. L. Anderson*, J. S. Caton², V. I. Burke², P. T. Berg², E. F. Holm², and S. L. Boyles³, ¹North Dakota State University, Carrington ²North Dakota State University, Fargo ³The Ohio State University, Columbus.

Crambe meal (CM) was evaluated as a protein for growing and finishing steers (avg. wt 293 ± 5.8 kg) in a 149 d study. Steers (n=90) were fed increasing levels of crambe meal (0, 33, 67 and 100%) in isonitrogenous protein supplement with reciprocal protein from soybean and sunflower meals. The pre-press solvent extracted CM contained 36.4% crude protein, 26.1% ADF, 31.75% NDF, and 74.4 umole/g total glucosinolates. Dry rolled corn, corn silage, and chopped wheat straw were in the TMR. Growing diets were fed for 84 d (64% concentrate) and finishing diets for an average of 76 d (78% concentrate). For the entire study, DMI improved in a linear $P < .01$ and quadratic manner ($P = .06$) with the addition of CM. Quadratic responses were also observed for average daily gain ($P = .06$) and feed efficiency ($P = .07$). with positive responses from intermediate levels of CM. Dressing percent increased ($P < .01$) and sensory evaluation of rib steaks improved ($P = .06$) with increasing CM. Linear decreases were observed for palmitic ($P = .07$) stearic ($P < .01$), and behenic acid ($P = .09$) with increasing CM level while linoleic acid increased ($P = .06$). In muscle tissue, myristic acid responded in a linear and quadratic manner to CM level ($P < .03$). These data suggest CM is a very effective protein source for growing and finishing cattle.

Item	Treatment					CM vs				
	0CM	33CM	67CM	100CM	URCM	P	no CM	Lin	Quad	Cub
DMI	9.18	9.54	9.70	9.54	9.59	.01	.33	.01	.01	.31
ADG	1.39	1.53	1.51	1.41	1.47	.06	.05	.86	.01	.58
FE	.153	.163	.159	.149	.155	.07	.73	.44	.02	.94

Key Words: Crambe Meal, Protein, Feedlot

994 The effect of laidlomycin propionate on the performance and sexual development of beef bulls. K. M. Downs, W. E. Kunkle*, T. T. Marshall, B. A. Reiling, and J. V. Yelich, *University of Florida, Gainesville.*

The effects of laidlomycin propionate (LP) on beef bull performance and sexual development were determined in a 112-d trial. Forty embryo transfer Angus bulls (259 kg initial full weight, 323 to 342 d of age) were fed three high concentrate diets containing either 0, 10, or 20 g/t levels (C, LP-10, LP-20) of LP. Full weight, hip height (HH), scrotal circumference (SC), and body condition (BC) were evaluated at 28-d intervals. Blood samples were also collected every 28 d for hormone (testosterone, insulin, IGF-1) and metabolite (PUN, glucose, NEFA) analysis. Changes in fat (FOE), marbling, and muscle (REA) were evaluated from d 0 to 84 using ultrasound. Breeding soundness examinations were conducted (d -1 and 75) to characterize semen. Average daily gain (kg/d) did not differ ($P = .33$) between the C (1.81), LP-10 (1.82), and LP-20 (1.90) treatments, and DMI (kg/d) was similar ($P = .91$) between treatments (C=9.16, LP-10=9.13, LP-20=9.13). Also, LP did not ($P = .30$) improve gain:feed (C=.198, LP-10=.199, LP-20=.209). Change in HH ($P = .34$) was similar for each treatment. Bulls fed LP-20 exhibited a greater ($P < .01$) increase (+22.0 cm²) in REA from d 0 to 112 than C (+16.4 cm²). Changes in BC ($P = .93$), FOE ($P = .76$), and marbling ($P = .55$) were not affected by LP. Bulls had similar ($P > .10$) SC between treatments, and no detrimental effects on semen quality or sperm morphology were observed. Blood testosterone ($P = .84$), glucose ($P = .49$), NEFA ($P = .78$), and IGF-1 ($P = .94$) concentrations were similar between treatments. PUN levels were highest ($P < .06$) for the LP-10 (7.91 mg/dl) and LP-20 (7.93 mg/dl) treatments and differed ($P = .03$) over time. Feeding LP to growing bulls had no detrimental effects on sexual development, semen production, or semen quality. However, LP did not improve bull growth or performance as shown previously with steers and heifers.

Key Words: Ionophores, Beef Bulls, Sexual Development

995 Least squares estimates of nutrient values from market prices of feedstuffs. N. St-Pierre¹ and D. Glamocic*, ¹The Ohio State University, Columbus, ²The University of Novi SAD, Yugoslavia.

Soybean meal and corn grain prices have long been used to estimate unit market values of crude protein and net energy. This approach is deficient in that (1) dairy production accounts for just a small fraction of total US demand in these two commodities, (2) an increasing large proportion of US dairy rations are made of by-products, and (3) crude protein is not an homogeneous nutrient fraction in ruminants. Our objectives were (1) to develop a procedure for the simultaneous estimation of nutrient values based on a large number of commodities, (2) to identify methods for automatic diagnostics of outliers, and (3) to determine the effect of time and location on estimates of market values. The cost per ton of a given feedstuffs (P_i) is equated to its nutrient content (Q_{ij}), unknown unit values (C_j), and an error term (E_i) as follows: $P_i = \sum C_j Q_{ij} + E_i$, $j=1, \dots, n$. A series of m such equations are set for each $m > n$ feedstuffs.

The resulting set of equations, $P = Q C + E$ has a least-square solution given by $C = [Q^1 Q]^{-1} Q^1 P$. This solution minimizes the sum of E_i^2 . Two problems may arise with this procedure. First, two or more of the parameter estimates may be highly correlated, leading to unstable solutions. Estimates of nutrient values are to be removed when variance inflation factors (VIF) exceed 100. Second, one or more feedstuffs may appear as outlier(s). We calculate the leverage of each observation as $q_i [Q^1 Q] q_i$ and delete any observation with leverage exceeding the threshold. The procedure was used to test the effects of location, year and month of the year on the estimated value of NE_L, RDP, RUP, and effective NDF. Prices of 22 feed ingredients were taken monthly from Feedstuffs magazine over the period 1983-1997, for the mid-west and west coast markets. Location, year and month of the year all had a significant effect ($P < .01$) on estimates of nutrient values. The procedure yields accurate estimates of aggregate values of nutrients and can be used to determine benchmarks for feeding costs and market value of alternate feedstuffs.

Key Words: Nutrient Value, Feedstuffs

996 Influence of ovariectomization (spaying) and feeding system on performance and carcass characteristic of beef heifers. R. Valenzuela^{1*}, A. Barreras¹, M. Cervantes¹, A. Plascencia¹, V. M. Gonzalez¹, and R. A. Zinn^{1,2}, ¹Universidad Autónoma de Baja California, Mexicali (México), ²University of California, Davis.

Thirty-two crossbreed heifers (246 Kg) were used in 98-d feedlot growth performance trial. Treatments were: 1) ovariectomized heifers fed a 2.18 Mcal/kg NEm diet throughout the 98-d trial (OVX-HHS); 2) ovariectomized heifers fed a 1.74 Mcal/kg NEm diet during first 70 d and then switched to a 2.18 Mcal/kg diet for the remaining 28 d (OVX-LHS); 3) intact heifers fed a 2.18 Mcal/kg diet throughout the 98-d trial (INTC-HHS); and 4) intact heifers fed a 1.74 Mcal/kg NEm diet during first 70 d and then switched to 2.18 Mcal/kg diet for the remaining 28-d (INTC-LHS). There were no interactions ($P > .20$) between spaying and feeding system on feedlot performance. Spaying did not affect DMI ($P > .20$). However, it increased ($P < .10$) ADG (12.3%), feed efficiency (6.3%), dietary NEm (5%), and NEg (6%). The increase in dietary NE due to spaying reflects a reduced maintenance energy requirement and/or leaner gain. Dry matter intake was lower (12.5%, $P < .01$), and ADG ($P < .10$) and feed efficiency (22.6%, $P < .01$) were greater for HHS than for LHS. There were no treatment effects on carcass characteristics except that fat thickness was higher ($P < .10$) for LHS than HHS. Spaying beef heifers enhances feedlot growth-performance. This effect is not influenced by dietary energy density.

Key Words: Heifers, Spaying, Dry Lot Feeding

997 Validation of real-time ultrasound technology for the use in predicting carcass composition and quality measurements of feedlot steers. R. S. Wells*, G. N. Hermesmeyer, D. B. Faulkner, and T. G. Nash, *University of Illinois, Urbana.*

Two studies were conducted to evaluate the Aloka[®] 500V real-time ultrasound console and the Critical Vision, Inc. ultrasound software for estimating carcass composition and quality measurements of feedlot steers. Backfat (USBF, cm), percent fat (USFAT) and area (USLMA, cm²) measurements of longissimus dorsi muscle were collected on crossbred steers for both studies. In Exp. 1, 384 hd were scanned once (1 scan for USFAT; 1 scan for USBF and USLMA) and regressed with carcass measurements over three slaughter groups. For the first slaughter group ($n = 81$) artificial insemination lubricant was used and resulted in unacceptable regression values for USBF, USFAT, and USLMA ($R^2 = .37, .01, .03$; RMSE = .24, 73.23, 9.70, respectively). Therefore, soybean oil was used for analysis of slaughter groups 2 and 3 ($n = 303$). Regression values for USBF, USFAT, and USLMA were numerically increased, $R^2 = .56, .21, .33$; RMSE = .26, 84.00, 6.92, respectively. Proximate analysis was conducted on longissimus dorsi muscle samples for slaughter group 3 ($n = 176$) and compared to USFAT ($R^2 = .35$; RMSE = 1.08). Prediction equations for conversion of USFAT values to marbling score were used from equations MKMARB (JAS 69:631-640) and ISUMARB (Iowa State University, 1997). Equation predictions were regressed with carcass marbling scores ($R^2 = .20$, RMSE = 84.39; $R^2 = .21$, RMSE = 83.88 for MKMARB and ISUMARB, respectively). For Exp. 2, 116 hd were scanned in triplicate (3 scans for USFAT; 3 scans for USBF and USLMA) and precision was increased with increasing number of scans. Values for one scan, average of two scans (AV2), and average of three scans (AV3) were calculated (USBF: $R^2 = .60, .76, .80$; RMSE = .20, .19, .19, USFAT: $R^2 = .85, .99, .99$; RMSE = 98.94, 95.71, 92.96, and USLMA: $R^2 = .50, .62, .70$; RMSE = 7.69, 7.56, 7.46, respectively for one scan, AV2, and AV3). The MKMARB equation was more accurate than ISUMARB equation ($R^2 = .99$, RMSE = 92.96; $R^2 = .32$, RMSE = 92.29).

Key Words: Ultrasound, Beef

998 Synovex-S[®] and -Plus[®] effects on holstein steer growth and carcass characteristics. D. M. Schaefer*, S. C. Arp, R. Rekaya, and M. G. Siemens, *University of Wisconsin-Madison.*

Estrogenic and androgenic implant effects on growth and carcass characteristics of yearling Holstein steers (456 kg) were evaluated. Seventy-five steers were blocked by weight and randomly assigned within block to pens of 5 steers/pen. One pen/block was randomly assigned to unimplanted control (C), Synovex-S (S) and Synovex-Plus (PI) treatments. Implants were administered on d 0 of the 116-d trial. The diet consisted (DM basis) of 10% corn silage-90% high-moisture corn and supplement. Supplemental protein sources (diet DM) were urea (0.5%), bloodmeal (3%) and soybean meal (5.7%). Lasalocid was included at 36 mg/kg DM. Analyses indicated that the diet contained 13.9% CP, 0.58% Ca, 0.35% P, 0.62% K, 0.16% S and 36 ppm Zn. Initial weight was used as the covariable and analyses were done considering pen to be the experimental unit. Results are shown below (Fwt=final weight (kg), DP=dressing percentage, Mat=skeletal maturity (A50=1.5), Marb=marbling (small0=5.0, modest0=6.0) and Fat (cm)).

Trt	Fwt	DMI	ADG	FCE	DP	Mat	Marb	REA	Fat	KHP
C	654 ^a	11.6 ^a	1.86 ^a	6.27 ^a	56.2	1.5 ^d	6.4 ^d	78.3 ^a	0.52	4.5 ^a
S	686 ^b	12.2 ^b	2.14 ^b	5.72 ^b	56.7	1.5 ^d	5.8 ^e	79.6 ^a	0.50	3.9 ^b
PI	715 ^c	12.7 ^c	2.38 ^c	5.36 ^c	56.3	1.6 ^e	5.8 ^e	84.4 ^b	0.46	3.8 ^b
SE	6.3	0.14	0.12	0.11	0.31	0.03	0.2	1.2	0.04	0.1

^{a,b,c} $P < 0.05$

^{d,e} $P < 0.10$

Percentages of steers receiving federally-assigned Choice grades were 76, 67 and 56 for C, S and PI, respectively. Increments in implant potency (PI>S>C) were detected with greater significance for growth than carcass quality or yield characteristics.

Key Words: Holstein, Implant, Growth

999 The effects of six times a day milking in early lactation on milk production and composition. A. H. Sanders*, M. A. Varner, and R. A. Erdman, *Animal and Avian Sciences Department University of Maryland, College Park.*

Fifty-eight Holstein cows on a commercial dairy farm were used to evaluate the effects of milking six times a day (6x) during the first six weeks of lactation, followed by three times a day (3x) milking during the remainder of the lactation. The purpose of this study was to determine whether an increase in production due to frequent milking was sustained into later lactation when milking frequency was reduced and to examine the effects of treatment on milk composition. At calving, cows were assigned to (6x) milking ($n=29$) or (3x) milking ($n=29$) groups. After 42 DIM, all cows were milked 3x. Milk weights were recorded by Boumatic in-line meters. Weekly milk samples were analyzed for percent fat and percent protein by a commercial laboratory. There was a significant effect of 6x milking on production ($p < 0.1$). Milk yield in weeks 3-8 of lactation was 41.2kg/d $\pm$ 1.0 and 38.6kg/d $\pm$ 1.1, for cows in the 6x and 3x groups, respectively. There was a significant treatment*time*parity interaction ($p < 0.01$). Primiparous cows had similar levels of milk production during the 6x treatment phase (33.5kg/d $\pm$ 1.9 vs 34.1kg/d $\pm$ 1.8, for 3x vs 6x, respectively). After cessation of 6x milking, milk production for primiparous cows in the 6x group was lower (35.8kg/d $\pm$ 1.9 vs 32.5kg/d $\pm$ 1.8, for 3x vs 6x, respectively). There was a beneficial carry-over effect of 6x treatment on production for multiparous cows, after cessation of 6x milking (42.1kg/d $\pm$ 1.1 vs 48.0kg/d $\pm$ 1.1, for 3x vs 6x, respectively). Protein levels were significantly reduced ($p < 0.05$) in 6x cows (2.89% $\pm$.04 vs 2.76% $\pm$.04, for 3x vs 6x respectively). Fat level was unaffected by 6x milking. These results suggest that short-term 6x milking may have long-term beneficial effects on milk production.

Key Words: Milking Frequency, Milk Production

1000 Comparison of leftover milks, milk yields and somatic cell counts using two milking machine detacher flow rates. J. S. Kikta*, G. W. Rogers, S. B. Spencer, C. W. Heald, and L. M. Sordillo, *The Pennsylvania State University, Pennsylvania.*

Duration of milking machine on-time is of increasing economic importance to modern dairy enterprises. Producers are shortening machine on-time by increasing the end of milking detacher setting flow rates (EMDSFR) to increase parlor and labor efficiency. This study measures the amount of leftover milk (LOM) in the udder following milking, milk yield and somatic cell counts (SCC) from cows being milked with detacher settings of 0.23 and 0.90 kg/min. Twenty Holstein cows were randomly assigned to two groups in a switchback design. LOM was defined as milk recovered after 2 min post-detachment milking and was measured by weighing milk in an in-line trap bucket. Cows were milked twice daily using Surge[®] milking equipment in a conventional stall barn. There was a significant treatment effect on the amount of LOM ($P \leq 0.0001$), with mean LOM being 0.63 kg and 0.33 kg for cows with EMDSFR of 0.90 and 0.23 kg/min respectively. No significant treatment effect on yield ($P \geq 0.88$) or SCC ($P \geq 0.25$) was found. These results encourage further experimentation with a greater number of cows to determine if increasing EMDSFR to shorten machine on-time is a desirable practice, despite the greater amounts of LOM in the udder.

Key Words: Milking Machine, Automatic Detacher, Flow Rate

1001 Biased estimates due to nonrandom censoring in a simulation study of the effect of milk production on days open. L. D. Warnick*, Y. T. Gröhn, H. G. Allore, and J. A. Hertl, *Cornell University, Ithaca, NY.*

In survival analysis, the validity of model parameter estimates depends on the assumption that censoring is random or at least independent of future event times. These assumptions are not always true for data from commercial dairy herds. For example, in studying the effect of milk yield on days open, cows culled before conception are treated as censored observations. Among other factors, culling depends both on milk yield and the perceived future fertility of the cow. Therefore, it can be difficult to interpret results from survival analyses of dairy epidemiological data because of the potential effect of nonrandom censoring. The purpose of this study was to compare parameter estimates from multivariable proportional hazards models for data sets with and without random censoring. This was done using simulated data with known relationships among the study factors. Two data sets were generated, each containing about 15,000 cows in 100 herds. The observation period started at calving and continued for at least 6 mo. Milk production and conception were programmed to be independent in both simulation runs. In the first run, culling was allowed to occur randomly while in the second, the probability of culling was decreased as milk production increased. For each data set, the effect of milk yield on days open was analyzed while controlling for calving season and parity. There was no association between milk yield and days open for the data set with random censoring. For data with increased culling for low milk production, days open increased with increased milk production. This demonstrates that an effect of milk production on culling, which could realistically be expected in commercial herds, can result in biased parameter estimates. Compared with other statistical methods for analyzing event times in dairy research, survival analysis models have the advantage of including observations censored due to culling. However, the results may be misleading when culling is dependent on explanatory factors of interest in the study.

Key Words: Survival Analysis, Simulation, Censoring

1002 The impact of somatotropin, milking frequency, and photoperiod on dairy farm nitrogen flows. T. F. Dunlap*, R. A. Kohn, G. E. Dahl, and R. A. Erdman, *University of Maryland, College Park.*

At least 3 technologies that improve milk production efficiency, bovine somatotropin (bST), three times daily milking (3X), and extended photoperiod, are available to dairy producers. A typical herd was simulated based on summaries of DHIA records, and mean milk production was 29.1 kg/d (SD = 8.9). Application of technologies (bST, 3X, and photoperiod) to lactating cows was predicted to increase mean 305-d milk production (initial = 9389 kg) by 1193, 1047, and 751 kg, respectively. Calving interval (CI) was adjusted from 428 d for the control herd to 437, 436, and 434 d on bST, 3X, and photoperiod, respectively, by an empirical relationship to 305-d milk. Four herds consisting of 1000 lactating and dry cows (34% primiparous) and enough growing heifers to sustain the herd were simulated for each treatment based on each predicted CI. For all herds, dry-period length was 60 d and heifers were predicted to calve at age 26 months. Growing heifers below age 100 d were fed as individuals and remaining heifers were divided into 5 groups by age, and TMR feeding was simulated for each group. Lactating cows were divided by NRC (1989) protein requirements into three TMR groups, and dry cows were fed as a separate group. Protein was fed to each simulated group at 1 SD above mean NRC predicted RDP and RUP requirements. Milk production and growth were adjusted for individual animals when NRC predicted inadequate dietary protein. Compared to the control herd, use of bST, 3X, and photoperiod increased each herd's predicted daily milk production from 29.1 kg to 33.1, 32.4, and 31.3 kg, respectively. Whole herd manure N excreted per kg of milk production was reduced 8% by bST, 7% by 3X, and 5% by photoperiod. Predicted whole herd N utilization efficiency (milk and meat N / herd intake N) was 28.5% for the control herd, 29.8% for the bST herd, 29.4% for the 3X herd, and 29.2% for the long photoperiod herd. We conclude that technologies that improve animal performance also have the potential to reduce environmental nutrient loading by increasing nutrient utilization efficiency.

1003 The economic value of information technology on dairy farms in The Netherlands. M.A.P.M. Van Asseldonk^{*1,2}, R.B.M. Huirne¹, A. A. Dijkhuizen¹, and M. A. Tomaszewski³, ¹Department of Economics and Management, Wageningen Agricultural University, The Netherlands, ²Department of Agricultural, Environmental and Systems Technology, Wageningen Agricultural University, The Netherlands, ³Department of Animal Science, Texas A&M University.

The effects of an automated concentrate feeder, on-line milk production measurement and activity measurement on milk production and reproduction were quantified empirically. Panel data comprised annual results of Dutch farms (operating in a milk quota system) for a period of 1987 to 1996 of adopters and non-adopters, as well as farm results before and after adoption. The control group provided a mean to distinguish between farm specific and trend effects. The group of adopters consisted of 295 farms with automated concentrate feeders, 153 of which had also adopted on-line milk measurement and 59 activity measurement. Effects were quantified by the PROC MIX procedure with herd, year, breed, herd size and years of technology adoption as main variables and years of technology adoption*herd as random effects.

An automated concentrate feeder resulted in an improvement of the annual milk (carrier), protein and fat production of 102 kg, 4.95 kg and 5.52 kg per cow respectively. In contrast, on-line milk production measurement did not have a significant effect on milk production records. Calving interval was reduced by 5.7 days after adoption of an activity measurement system and was not affected by adoption of an automated concentrate feeder or on-line milk production measurement. To break even the annual costs of the investment in an automated concentrate feeder or the additional annual costs of activity measurement in case of a simultaneous investment in an automated concentrate feeder, the size of a farm should be about 30 and 50 cows or more respectively.

Key Words: Management, Information Technology, Panel Data Analysis

1004 A whole-farm approach to manure management and nutrient balance. T. N. Cramer, D. C. Grusenmeyer*, C. G. Cogger, and A. I. Bary, Washington State University, Pullman, WA.

Traditional best management practices often are inadequate to address manure management on high-production dairies that import large nutrient amounts. To be economically and environmentally sustainable, manure management plans must be evaluated in the broader context of whole-farm nutrient flows. A 2-year project was conducted to: 1) measure whole-farm nutrient flows on 3 dairies with contrasting herd size and management, 2) develop farmer interest and involvement in whole-farm nutrient management, and 3) integrate whole farm nutrient budgeting with manure management planning. Three cooperating farmers measured nutrient flows through their farms. Data collection included: 1) Nutrient import (purchased feed, animals, fertilizers, bedding) and nutrient export (milk, animals, manure), 2) Field nutrient cycling: a) manure nutrient application, b) crop yield and nutrient uptake, c) seasonal soil tests: Spring P and K, pre-sidedress and post-harvest nitrate. Nutrient imports were much greater than exports. N imports were more than triple N exports on a typical 370-cow dairy with a 220-acre land base. The dairy had a moderate animal density, no young stock on farm, and negligible commercial fertilizer imports. Manure N production was 121 kg/cow/year as applied to the field, after storage losses. This is 30% greater than standard book values for manure N before storage losses. Potassium in manure was double the book value at 127 kg produced/cow/year. Post-harvest soil nitrate residual in corn ground was high at over 140 kg nitrate N/ha. Manure on this dairy provided 157% of crop N uptake, 223% of P uptake, and 158% of K uptake. This is a valuable educational tool in showing producers the nature and magnitude of nutrient imbalances, and the inadequacy of book values in managing nutrients. Future manure management must focus on reducing nutrient imbalances through reduced nutrient imports, increased exports and increased nutrient utilization efficiency.

Key Words: Manure, Nutrient, Management Systems

1005 Implications of N- or P-based nutrient management in three animal agricultural systems. Z. Dou*, R. Boston, J. Ferguson, D. Galligan, W. Chalupa, and C. Ramberg, University of Pennsylvania Center for Animal Health and Productivity, Kennett Sq.

The sustainability of animal agriculture depends on the ability of the industry to work in accordance with the environment. Current recommendations for managing animal manure are largely N-based while excessive P in soil associated with water pollution problems is an increasing concern. The objective of the present work was to examine the implications of N- and P-based nutrient management approaches on cropland needs and nutrient balances for typical dairy, swine, and poultry systems. Using book values of manure and crop nutrient data (see table footnotes below), our work indicated that N- or P-based approach would result in substantial differences in crop area needed to utilize the targeted nutrient. For instance, with the N-based approach the area of corn silage yielding 33.6 tonne/ha would be 0.16, 0.17, or 0.21 ha/AU (Animal Unit, 1 AU = 454 kg live animal weight) for dairy, swine, or broiler manure, respectively, compared to 0.32, 0.70, or 0.73 ha/AU if using the P-based approach. While the N-based approach may result in excess P and K application ranging from 90 to 254 kg/ha/yr for P₂O₅ and 153 to 178 kg/ha/yr for K₂O, considerable amounts of N and K fertilizers would be required with the P-based approach to sustain crop production.

Trait	Dairy ¹	Swine ¹	Poultry ¹
N-based approach²			
Crop area requirement ³ , ha/AU	0.16	0.17	0.21
Nutrient blance ⁴ ,kgN/ha	0	0	0
kgP ₂ O ₅ /ha	90	254	246
kgK ₂ O/ha	161	153	178
P-based approach²			
Crop area requirement ³ , ha/AU	0.32	0.70	0.73
Nutrient blance ⁴ ,kgN/ha	-78	-113	-108
kgP ₂ O ₅ /ha	0	0	0
kgK ₂ O/ha	-17	-101	-123

¹Manure production (kg/AU/day) and manure N-P₂O₅-K₂O (kg/tonne) are 37 and 5-2-4 for dairy, 30 and 7-5.5-5.5 for swine, 5.4 and 37-32-23 for broiler, respectively. Source: PA Manure Management Manual.
²Efficiencies of manure nutrients were set at 0.35 for the N of dairy and swine and 0.45 of broiler manure, and 1.0 for phosphate and potash of all manure.
³For corn silage of 33.6 tonne/ha with N-P₂O₅-K₂O removal of 4.5-2.5-5.5 kg/tonne.
⁴Positive sign (+) stands for excess and negative sign (-) for insufficiency of nutrient application compared to crop requirement.

Key Words: Nutrient Management, Animal Agriculture

1006 WITHDRAWN.

1007 Utilization of AI-technician scores for body condition, uterine tone and uterine content to pregnancy risk at first A.I. in holstein dairy cows. S. H. Loeffler*¹, M. J. de Vries¹, Y. H. Schukken², F. M. de Graaf³, and A. A. Dijkhuizen⁴, ¹Animal Health Service, Utrecht, ²Dept. of Herd Health and Reproduction, Faculty of Veterinary Medicine, University of Utrecht, ³Dept. of Economics and Farm Management, Wageningen University, ⁴Holland Genetics, Arnhem (The Netherlands).

Observations on body condition score and several parameters related to estrus and/or metritis were performed by 8 professional AI-technicians for 2740 inseminations on 23 farms. Data on disease prior to or within 21 days post-insemination and closest test day milk production were added as other co-variables for modelling risk of pregnancy. Logistic regression models were used to determine the adjusted odds ratios for first service pregnancy. Clear, stringy vaginal discharge, cervical passage of the AI-gun and lameness were not significant (p <0.05) predictors of pregnancy at first AI. Significant cow-level predictors of pregnancy in models examined were body condition score, uterine tone, foul on the tip of the AI gunpost-insemination, fat-protein corrected kg milk, days in milk (DIM) at AI, mastitis, metritis-pyometra complex and cystic ovarian disease. DIM proved to have the largest attributable proportion for pregnancy risk with significant lowered risk for cows at 66-81 and >156 DIM. Cows with a body condition score of 3 at first AI were most likely to become pregnant as compared to <=2.5 (OR=0.65) or >=3.5 (OR=0.74). Lack of uterine tone was associated with a lowered pregnancy risk (OR=0.69) as was foul on the AI-gun post insemination (OR=0.67). Clinical mastitis and cystic ovarian disease were associated with a strong decrease in pregnancy odds, but had a much lower attributable proportion than metritis-pyometra complex due to the high lactational incidence of the latter. AI-technician parameters such as those described in this paper have potential use as management tools for the farmer.

Key Words: Fertility, Condition Score, Uterine Tone

1008 The effects of time of disease occurrence, test-day milk yield and change in body condition on conception at first insemination. S. H. Loeffler¹, M. J. de Vries^{*1}, and Y. H. Schukken², ¹*Animal Health Service, Utrecht* ²*Dept. of Herd Health and Reproduction, Faculty of Veterinary Medicine, University of Utrecht, The Netherlands.*

This study examined the effects of lameness, metabolic and reproductive diseases, clinical mastitis and test-day milk data on the pregnancy risk at first AI. Data consisted of 9369 first inseminations in the interval 20–180 days in milk (DIM) of first and later lactation cows on 44 farms. All farms participated in herd health monitoring schemes of either the ambulatory clinic of the veterinary faculty or a 3-man private cattle practice during a 5-year period. Incidence rates were weighed according to time of disease occurrence in order to determine which diseases had short-term and which diseases had long-term effects on pregnancy risk. Factors which had a negative and significant ($P < 0.05$) effect on pregnancy risk were: a drop in body condition score (BCS) from calving to (approximately) 100 days in milk, clinical mastitis within 3 weeks after AI, a recent diagnosis of cystic ovarian disease, endometritis-pyometra complex prior to or within 3 weeks after AI, displaced abomasum any time prior to AI, changes in fat/protein ratios of more than 0.2 from the test day prior to AI to the test-day after AI, a high milk yield on the test-day just prior to AI. Variation in pregnancy risk between farms was greater than variation between cows, showing that management at the farm-level is an important aspect of fertility. Repeatability of disease within cows was low. This research stresses the fact that the point at which disease occurs prior to AI should be taken into account when examining disease effects. This is most important for clinical mastitis, its deleterious effect on reproduction being strongly underestimated if time of occurrence was not considered. Since it affected conception risk mostly if it occurred after AI.

Key Words: Fertility, Disease, Mastitis

1009 Evaluation of overall reproductive performance in dairy herds. J. C. Plaizier^{*}, K. D. Lissemore, D. F. Kelton, and G. J. King, *University of Guelph, Canada.*

Reproductive efficiency was assessed in 106 commercial dairy herds in Ontario in two subsequent years. Differences in reproductive performance among herds were expressed in variation in historical calving interval (HCI), projected calving interval (PCI), and reproductive culling rate (RCR). Average HCI, PCI, and RCR were 13.2 mo, 13.1 mo, and 7.5 %, respectively. Herds with similar in HCI or PCI could vary widely in RCR. The correlation coefficient between RCR and HCI and between RCR and PCI were -0.23 and not significant, respectively. The coefficient of variation associated with RCR (75.7%) was much higher than that of HCI (3.8%) and PCI (4.5%). The repeatability of the RCR (0.26) was much lower than that of HCI (0.81) and PCI (0.60). This is explained by the fact that RCR is not only influenced by overall herd reproductive performance, but also by differences in maximal allowable days open for rebreeding and perception of which cows were culled for reproductive failure. Additionally, a high coefficient of variation for RCR is unavoidable due to its binomial distribution and its low average (7.5 %). These disadvantages of RCR are not a sufficient reason for excluding the measure from a comprehensive assessment of overall herd reproductive performance. PCI and RCR can be combined into the adjusted calving interval (ACI), by dividing PCI by the proportion of the herd not culled for reproductive failure, and thus interpreted jointly. On 40.5 % of farms providing data for this study, fertility assessment based on PCI indicated better reproductive performance than that based on ACI. Hence, assessment of herd fertility on the basis of PCI can lead to a different and erroneous conclusion regarding the level of herd fertility than the evaluation based on ACI.

Key Words: Herd Reproductive Performance, Calving Interval, Culling

1010 The effect of type on efficiency in Holstein cows. J. Püski^{*1}, A. Gáspárdy², T. A. Tuan¹, S. Bozó³, and E. Szücs⁻¹, ¹*Gödöllő University of Agricultural Science, Gödöllő*, ²*University of Veterinary Science, Budapest*, ³*Research Institute for Animal Breeding and Nutrition, Herceghalom (Hungary).*

Milk production, milk protein and butterfat production were studied using figures of 1816 Holstein cows in the first parity. Apart from traits of economic importance, figures of type classification were evaluated as well. Findings were analyzed by ANOVA, bivariate correlation and multivariate regression analysis. Cows were classified into six type categories as follows: (1) short - narrow (26.1 %), (2) short - wide (1.4 %), (3) intermediate - narrow (44.2 %), (4) intermediate - wide (24.0 %), (5) tall - narrow (1.3 %) and (6) tall - wide (3.0 %) according to scores for stature and rump width. Means and SD of 305 days milk were 7880 ± 1200 , 8068 ± 1605 , 8038 ± 1240 , 8156 ± 1236 , 8307 ± 1229 , 8263 ± 1738 kg., resp. Overall means for milk protein and butterfat yield and milk protein as well as butterfat percentage were 257 ± 37 kg., 272 ± 38 kg., 3.21 ± 0.18 , 3.41 ± 0.36 , resp. Efficiency of milk production (y_1), milk protein (y_2) and butterfat yield (y_3) were calculated according to formulas as follows: $y_1 = (305 \text{ days lactation milk yield/body capacity})/100$, $y_2 = \text{milk protein yield/body capacity}$, and $y_3 = \text{butterfat yield/body capacity}$. Mean values for efficiency of milk production according to type categories were 114.5 ± 17.8 , 113.3 ± 22.0 , 108.9 ± 16.9 , 106.3 ± 16.21 , 104.4 ± 15.2 and 102.2 ± 21.3 , resp. Even though tall cows attained the highest yields independent of their rump width, milk was produced by short cows most efficiently. Bivariate coefficients of correlation between efficiency of milk production and 305 days milk yield, protein yield, butterfat yield, milk protein percentage, butterfat percentage, stature, chest width, rump width, body depth, udder depth, rear udder width and body capacity were $r = 0.93, 0.85, 0.66, -0.39, -0.50, -0.22, -0.25, -0.14, -0.20, -0.27, 0.13$, and -0.25 , resp. Coefficients of correlation and stepwise multivariate regression analysis reveal that among type scores, the efficiency of milk production is determined by stature, chest width, udder depth, rear udder width and body capacity ($R^2 = 0.17, P < 0.001$).

Key Words: Holstein, Milk Production, Efficiency

1011 Effect of underfeeding Holstein-Friesian heifers during the second gestation on nitrogen balance and milk production around the second parturition. J. M. Moorby^{*} and S. Miles, *Institute of Grassland and Environmental Research, Aberystwyth, United Kingdom.*

Dry period feeding can have important residual effects on the subsequent lactation performance in dairy cows. This experiment was designed to investigate the effects of heifer age and level of concentrate offered during the second half of the first lactation on N balance and milk production. Twelve Holstein-Friesian heifers, offered ryegrass silage *ad libitum* in a continuous design experiment, were divided into 4 groups by age at first calving (2 or 3 years old) and level of concentrate allowance (Low: 2 kg/d, or High: 7 kg/d) during the last 18–20 weeks of their first lactation. The dry period diet was the same for all treatment groups. N balance was measured at 10–12 weeks (lactating) and 3–4 weeks (dry) before the predicted second calving date. At the end of their first lactation, depending on their age, animals offered the High concentrate level either retained more body N or produced more milk. Milk protein and fat concentrations were not different between treatment groups. Despite all groups being in positive N balance when dry, the N retained by older animals previously offered the Low concentrate allowance was only just sufficient to cover fetal N requirements. The results suggest that heifers need careful management at the end of their first lactation.

Age at 1st calving:	2 Years		3 Years		SED
	Low	High	Low	High	
N Balance, g N/d					
End 1st Lact.	-15^a	30^a	23^a	121^b	41.3
Dry Period	34	51	19	43	19.9
Milk Yield, kg/d					
End 1st Lact.	12.0^a	19.4^b	14.0^a	14.8^a	1.66

Different superscripts with a row indicate a significant difference ($p < 0.05$).

Key Words: N Balance, Milk Production, Transition Feeding

1012 Milk production and reproduction response of two breeds of heat stressed dairy cows to an open space cooling system. C. M. Howison*, D. V. Armstrong, A. Correa-Calderon, and S. K. DeNise, *University of Arizona, Tucson.*

In semi-arid environments, high ambient temperatures reduce milk production and reproduction response in heat stressed dairy cows. The objective of this trial was to evaluate the effectiveness of an open space cooling system in minimizing this problem. The open space system consists of a fan with a 2.4m diameter blade that circulates 1416m³ of air/min and 5.7–6.8L of water/min. The duration of the trial lasted 84 days (June 28–September 19, 1997) with a daily high temperature-humidity index (THI) range of 79–85. 73 lactating Holstein and Brown Swiss cows were divided among two treatments and the results are summarized in the following table.

	CONTROL	OPEN SPACE
# COWS	37	36
TOTAL MILK (kg/d)*	30.9	32.7
HOLSTEIN		
# COWS	18	18
TOTAL MILK (kg/d)*	31.1	34.1
% PREGNANT	18.2	18.2
SWISS		
# COWS	19	18
TOTAL MILK (kg/d)*	30.9	31.5
% PREGNANT	20	50

*Significant at p<.05 level

Milk production data was collected daily (a.m. & p.m.) and averaged per week. The reproductive data was summarized at the end of the trial. Both Holstein and Brown Swiss had higher milk production in the cooled group. There was no reproductive gain in cooling the Holstein cows, while the Brown Swiss benefited from cooling.

Key Words: Heat Stress, Cooling Systems, Milk Production

1013 Equations to predict dry matter intake, body weight and first lactation milk yield of holstein heifers in a microcomputer simulation. G. L. Bethard², M. L. McGilliard¹, R. E. James*¹, H. Chester-Jones³, and J. G. Linn³, ¹*Virginia Polytechnic Institute and State University, Blacksburg*, ²*New Mexico State University, Las Cruces*, ³*University of Minnesota, St. Paul.*

Equations were developed to predict BW and DMI of Holstein heifers from birth until calving and first lactation milk yield based on body weight for use in a microcomputer simulation. Holstein heifer data from VA and MN were obtained for three approximate age ranges: birth to weaning, 3 to 17 mo, and 17 mo until calving. First lactation milk yield equation was developed from a stepwise regression analysis of 50,745 DHIA lactation records from 664 herds in VA. Model criteria included R-squared, PRESS statistic, and C(p) statistic. Body weight equations for ages 0 to 42 d, 5 to 17 mo, and 17 to 28 mo explained 93, 91, and 99% of the variation in body weight. Equations to predict intake of calf starter from birth to 42 d explained 45 to 90% of the variation. Dry matter intake equation for 17 to 28 mo explained 61% of the variation. Equation to predict first lactation milk yield was: $4663 - 2.74 \times \text{BW} - 3.03 \times \text{AFC} + 0.258 \times \text{MATMILK} - 0.001483 \times \text{AFC}^2 - 0.011583 \times \text{BWDEV}^2 + 0.004452 \times \text{BW} \times \text{AFC} + 0.022875 \times \text{BW} \times \text{BWDEV} + 0.000484 \times \text{AFC} \times \text{MATMILK} - 0.001013 \times \text{BWDEV} \times \text{MATMILK}$ where: BW = post-calving BW (kg) for first lactation Holstein heifers; AFC = age at first calving (d); BWDEV = herd average BW for third and later lactation (mature) animals (kg) - BW (kg); MATMILK = herd average 305 d milk yield for third and later lactation (mature) animals. Season effects (-85.16, -69.41, -225.57, and 0 for winter, spring, summer, and fall), were averaged (-95.01) and added to the intercept (4758.65). Maximum milk yield for heifers calving at 20, 22, 24, 26, 28, and 30 mo occurred when post-calving BW was 550, 554, 558, 561, 565, and 569 kg, respectively. Milk yield declined when post-calving BW exceed 590 kg.

Key Words: Heifer, Equations, Simulation

1014 Assessment of mastitic infection in bovine milk using ATP bioluminescence. M. J. Meyer*, K. A. Schmidt, and J. E. Shirley, *Kansas State University, Manhattan.*

Few choices exist for a mobile, rapid and non-subjective assay for assessment of mastitic infection in bovine milk. This project assessed the effectiveness of using the Biotrace[®] raw milk quality ATP bioluminescence assay to serve this role. Milks with varying amounts of somatic cell counts (13,000–2,500,000) and signs of mastitic infection were obtained from the Kansas State University Dairy Teaching and Research Center. Within 24 hours, raw milk samples were evaluated for microbial numbers, somatic cell counts and relative light units (RLU). The printed test procedure was modified to accurately evaluate clinical mastitic milk samples. Results showed that as somatic cell count increased in raw milk, the RLU value increased. Also, the RLU values could correlate and differentiate among milks with varying levels of mastitic infection (none, sub-clinical and clinical) (p = 0.05). Repeatability of the ATP bioluminescence method was very good (C.V. = 4.76%). These results suggest that the Biotrace[®] raw milk quality test kit can effectively serve as a non-subjective, rapid assay to determine the degree of mastitic infection in bovine milk.

Key Words: Mastitis, Rapid Test, ATP Bioluminescence

1015 Ceramic ruminal bolus as a safe and tamper-proof method for electronic identification of dairy cattle at all ages. G. Caja^{1*}, C. Conill¹, R. Nehring¹, O. Ribó², C. Korn², and J. F. Vilaseca³, ¹*Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain.* ²*ISIS Sa-Ve-Tech, Joint Research Centre, 21020 Ispra, Italy.* ³*Gesimpex Com., 08037 Barcelona, Spain.*

A ruminal bolus was developed to obtain a permanent electronic identification system for ruminants. The bolus was designed in Alumina, a non porous and radio-frequency transparent ceramic material (Patent PCT/FR/97/00744), to be orally administrated to cattle. Specific gravity, shape and dimensions (70×20mm) were adapted to obtain its permanent retention in the fore-stomach of new born calves and adult cows. Different types of glass encapsulated transponders can be placed inside the bolus. In this trial 32.5×3.8mm HDX transponders (Tiris, Texas Ins., Almelo, NL) were used. A total of 97 Holstein calves (<1 week old) and 119 Holstein dairy cows (68 lactating and 51 dried cows) on two dairy farms were orally fed with the ceramic boluses. Three of the lactating cows have a rumen cannula. After dosage of one bolus to each animal, they were read using a hand-held reader connected to a 60cm stick antenna (Gesreader I, Gesimpex Com.). Most boluses (>95%) were localized immediately after in the reticulum and 100% were still in place after 2 years. This was verified by radiography in a sample of 2 calves of 4d old, and directly retrieving the bolus by hand in the cannulated cows every month during the first year. Development of the reticulum in the 2d old calves showed enough room for bolus retention and did not modify the intake of colostrum nor milk replacer. Bolus transponders also showed a 100% reading efficiency in restrained animals, with different hand-held readers (Gesreader I; Hokofarm, Insentec, Marknesse, NL; and Ri-hhu-w2dc, Tiris), and in animals walking through a race-way equipped with a transceiver (S-2000, Gesimpex), working at 140 dbμV/m, and a 94×52cm antenna (Tiris). Milk yield (8,663kg in 305 DIM), growth of calves, health and general behavior of all animals were unaltered by the bolus. In conclusion, the designed ruminal bolus was considered successful as a uniquely transponder carrier and a tamper-proof and safe device for the identification of dairy cattle.

Key Words: Electronic Identification, Transponders, Ruminal Bolus

1016 Influence of injected retinol and tocopherol on embryo quality and dairy herd reproductive performance. C. Beinlich* and D. W. Shaw, *Department of Veterinary Preventive Medicine, The Ohio State University.*

We evaluated the influence of retinol palmitate and tocopherol (Vital E+A, Schering-Plough Animal Health) on first service conception rate, embryo quality and services per conception using 239 cows located on two commercial dairies. Cows having no detectable reproductive pathology and not inseminated by d 60 postpartum received prostaglandin F2a (25 mg, i.m.) on the first Monday following d 60 postpartum and a second injection 12 d later. Every other cow entering the trial received 1 million I.U. retinol and 1500 I.U. tocopherol (5cc Vital E+A, i.m.) 4 d prior to the second injection of prostaglandin (6 d prior to expected estrus). Cows observed in estrus following the second prostaglandin injection were artificially inseminated by the herdsman using one 1/4 cc straw of frozen-thawed semen according to the AM/PM rule. The trial continued for approximately one production cycle (13 months). A randomly allotted subset of inseminated cows (8 controls, 9 treated) underwent nonsurgical embryo recovery 7 days post insemination. Recovered embryos were evaluated for developmental stage and grade. Analysis by farm, parity and milk production failed to show significance, so all data were pooled. Estrus detection, first service conception and services per conception for control vs treated cows were 38% vs 37 %, 37% vs 48% and 3.29 ± 0.2 vs 3.35 ± 0.2 , respectively. Differences between treatments were not significant. Percent transferable embryos recovered were 25% for controls vs 66% for treated cows ($P=0.02$). The beneficial effects of retinol on embryo quality observed in this and other studies may be too small to affect herd level reproductive parameters within the context of 1 production cycle.

Key Words: Bovine, Vitamin A, Reproduction

1017 Effect of soyhull:soy lecithin:soapstock mixture on lactation performance in dairy cows. W. M. Chapman, J. C. Ward*, R. J. Grant, and L. L. Larson, *University of Nebraska, Lincoln.*

Thirty-seven Holstein cows were blocked by parity and calving date and assigned to 1 of 2 diets from 3 to 14 wk of lactation: 1) Control with no supplements or 2) supplemental lipid. Both diets contained 45% forage and 55% of a concentrate mix with 17% soyhulls. The dietary variable was a lecithin:soapstock mixture (1:1, DM basis) as supplemental lipid added to the diet at 0 or 3% DM. Soyhulls were mixed with the lecithin and soapstock mixture at 85:15 (DM basis). The DMI was increased ($P<0.05$) by addition of lipid for both primi- and multiparous cows. The soy lipid depressed synthesis of milk protein and fat ($P<0.05$), but increased the production of 4% FCM for both parities. The efficiency of FCM production (FCM/DMI) for primi- and multiparous cows fed control and lipid diets, respectively was: 1.17, 1.29, 1.21, and 1.22, with lipid increasing efficiency ($P<0.05$) for primiparous cows only. The in situ NDF digestion kinetics of soyhulls was not affected by diet and averaged 8.3 h lag, .117/h rate of digestion, and 96.5% extent of digestion. Results indicated that supplemental lipid as a lecithin:soapstock mixture elevated milk yield and DMI for both primi- and multiparous cows.

Key Words: Soy Lecithin, Lipid, Milk Yield

1018 Lactation performance of dairy cows receiving monensin and a sustained release formulation of methionyl bovine somatotropin. R. K. McGuffey*¹ and B. Giner-Chavez², ¹Elanco Animal Health, Greenfield IN and ²Mexico, D. F., Mexico.

An experiment was conducted to determine the effect of starting time of injections of somatotropin (sometribove, 500 mg/14 d) (S) on body condition score and reproductive performance in dairy cows fed monensin (M) fed in a total mixed ration at 0 or 20 mg/kg DM. Multiparous cows (n=667) were blocked in groups of four based on milk yield during days 12 to 18 of lactation and lactation number and randomly moved at 22 days in milk (DIM) to corrals. Cows within a corral received a total mixed ration (TMR) containing M at either 0 or 20 mg/kg dry matter. Within each level of M, injection of S began at either 63 or 105 DIM. Cows were maintained in corrals (n=4) to approximately 245 DIM, milked 3x/d and fed 4 to 14 times daily. Performance for 224 days of treatment is shown in the table.

Item	Units	M=0, S@63	M=0, S@105	M=20, S@63	M=20, S@105
Cows	N	166	167	167	167
Milk	kg/d	40.7	40.0	40.9	40.7
Fat	%	3.31	3.29	3.32	3.36
Protein	%	3.05	3.03	3.04	3.01
Body condition	d22	3.27	3.26	3.23	3.24
score at	d63	3.09	3.11	3.13	3.13
score at	d105	3.09	3.15	3.13	3.18
score at	d245	3.18	3.26	3.27	3.31
1 st insemin.	D	72.1	74.3	73.2	71.5
Preg. Det'n. ¹	d	142.8	142.4	139.2	140.7
Preg./ No. cows		154/166	144/167	147/167	146/167
Inseminations	no.	418	395	403	402

¹ Average day of pregnancy determination by palpation.

Dry matter intake (kg/d) averaged 24.5 for cows fed a TMR without M compared to 22.9 for cows fed a TMR with M. Body condition was higher in cows supplemented with M at each time point after injections of S began. Breeding efficiency was not compromised by initiation of S injections at 63 DIM compared to delaying the initiation of S injections to 105 DIM.

Key Words: Monensin, Somatotropin

1019 A simple methodology may be used for early identification of responsive dairy cows to recombinant bovine somatotropin. P. H. M. Rodrigues*, C. S. Lucci, L. F. Laranja da Fonseca, and F. R. Lima, *University of Sao Paulo Faculdade de Medicina Veterinaria e Zootecnia Pirassununga, Sao Paulo, Brazil.*

Forty eight primiparous Holsteins cows at 202 (± 59) days in milk and daily milk production of 22 (± 5.3) liters at the beginning of the experiment were used to study the possibility of identifying animals that are more responsive to recombinant bovine somatotropin (rBST). Animals were housed in free-stall barns, and milked 3 times a day and fed a total mixed ration diet. Animals were injected with 5 doses (500 mg each) of rBST every 21 days (105-days total period). Daily milk production of treated animals were recorded to measure average apparent response (AAR) and top response (TR). AAR was defined as the average increase in milk production, expressed as liters/cow/day, for days 0 to 18 after dosing, as compared to the average production calculated for days -1, -2, -3, 19, 20 and 21 after dosing. TR was calculated as increase in milk production for each day from 0 to 18 days after dosing as compared to the average production for days -1, -2, -3. There was a positive linear correlation ($r=0.6082$; $P=0.0001$) between AAR for the first 21 days and AAR to the total 105-days period. A correlation coefficient was calculated between each individual TR value and the overall AAR for the total 105-days period. The highest correlation coefficient ($r=0.5112$; $P=0.0002$) were observed for days 8, 9 and 10, so these days may be considered the best estimates for calculating AAR when daily milk production records are not available. Our results suggest that it may be possible to identify responsible cows to rBST by using a simple methodology of calculating TR for days 8, 9 and 10 after dosing. However, other factors such as milk production level and mammary gland health status before rBST treatment showed to affect this response, while stage of lactation after 120 days did not. Further studies should be conducted to improve accuracy of this methodology.

Key Words: Bovine Somatotropin, Milk Production, Dairy Cattle

1020 The effect of forage source on manure carbon and nitrogen mineralization. J. S. Van Kessel^{1*}, J. B. Reeves III¹, J. J. Meisinger², and V. A. Wilkerson¹, ¹*Nutrient Conservation and Metabolism Laboratory and* ²*Environmental Chemistry Laboratory, USDA-ARS, Beltsville, MD.*

The organic fraction of manure N is a valuable nutrient for field crops but it is not available for plant use until it has been converted to NH_4^+ or NO_3^- (i.e. mineralized). The rate at which manure organic N becomes available is not easily predicted; for example, estimates of availability in the first year after application range from 0 to 50% and the effect of diet is unknown. The objective of this study was to determine if manure C and N mineralization characteristics were altered when cows were fed alfalfa or orchardgrass silage in a TMR. Urine and feces were collected from a companion trial in which lactating cows (2 per treatment) were fed a 30% NDF diet containing alfalfa silage (AS), a 30% NDF diet containing orchardgrass silage or a diet containing orchardgrass (OS) at the same forage to concentrate ratio as AS (35% NDF, ROS). Urine and feces were mixed in the proportions excreted. Rates and extents of N and C mineralization were determined by incubating manure-amended soil at 25°C in an aerobic environment. The production of CO_2 and the appearance of NH_4^+ plus NO_3^- were monitored over 16 wk. CO_2 -C production followed first-order kinetics for all treatments. The rate and maximal extent of CO_2 -C production were not different ($P > .7$ and $P > .9$, respectively) across treatments (.19 d^{-1} and 27% of added C, respectively). Nitrification was initiated between 7 and 14 d and all NH_4^+ was converted to NO_3^- by 56 d in all treatments. Mineralization of non-urea organic N began between 2 and 7 d in the AS incubations, however, net mineralization was not observed in manure from the OS and AOS treatments until 28 d. Mineralization of N in manure from animals fed the AS diet reached 26% of added organic N by 56 d. Only 15% of the organic N was mineralized at 56 d in the OS and ROS treatments. These data show that although the inorganic manure N is immediately available for plant use, mineralization of the organic N in manure is a slow process and may be affected by dietary forage.

Key Words: Manure, Nitrogen, Forage

1021 Ammonia release and nitrogen loss from fresh dairy manure. A. M. Lefcourt*, J. J. Meisinger, V. Wilkerson, J. S. Van Kessel, B. Glenn, and R. B. Thompson, *USDA-ARS, Beltsville, MD.*

Up to half of the nitrogen initially in dairy manure is lost through the conversion of urea to ammonia and its subsequent volatilization. In addition to reducing the fertilizer value of the manure, volatilization of ammonia has been shown to increase atmospheric levels of ammonia, and atmospheric ammonia originating from agricultural sectors has been implicated in widespread damage to ecosystems in Europe. To examine the rate and time course of ammonia release from fresh manure, feces and urine were collected from 6 mid-lactation cows over 24 h and subsequently mixed. Urines were analyzed for ammonia-N, urea-N, and total-N. Six windtunnels (.5 m/s) with phosphoric acid traps at inlets and outlets were used to measure ammonia release from samples of manure spread on fiberglass trays. To examine effects of diet, 2 pairs of cows in a companion study were fed diets with either orchardgrass or alfalfa at 30% NDF. For the third pair, orchardgrass was used at the same concentration as alfalfa in the alfalfa diet (35% NDF). Ammonia release was monitored for 7 d. Most of the ammonia was released within 48 h and cumulative ammonia release reached a plateau at 72 h. Estimated cumulative ammonia release for manure collected from a single cow over 24 h was 99 ± 7 mg. Nitrogen losses from the manures were estimated (Kjeldahl analyses) at the equivalent of 130 ± 9 mg ammonia which represent about 35% of the initial nitrogen. There was no significant effect of diet on rate of ammonia release. Nitrogen quantites in urines could account for only $75 \pm 3\%$ of the nitrogen losses and could not account for the ammonia captured even assuming the efficiencies of the windtunnels were 100%. It is assumed that the nitrification/denitrification process contributed significantly to nitrogen losses. In summary, for cows in this study, the equivalent of 100 mg of ammonia per cow was released from untreated fresh manure into the atmosphere each day. This ammonia release could only partially be accounted for by the amount of urea in urine. In conclusion, management procedures designed to prevent loss of nitrogen from fresh dairy manure have only hours to prevent initial losses through ammonia volatilization.

Key Words: Ammonia Volatilization, Dairy, Manure

1022 Measurement of subdermal fat in dairy cattle along lactation by two ultrasonic machines. F. N. Domatob*¹, S. L. Spahr¹, J. E. Novakofski¹, A. Mizrach², and E. Maltz², ¹*University of Illinois, Urbana,* ²*ARO, Bet Dagan (Israel).*

The feasibility of using digitized scans of subdermal fat thickness (sfat) at three body sites along lactation for prediction of body condition score (BCS) was investigated. Ultrasonic scans of sfat were obtained from rib, loin and center of the rump at 14-day intervals from three weeks pre calving to 17 weeks of lactation on five cows. Cows were weighed, and scored for body condition every two weeks. Twice a day milk yield was recorded and averaged weekly. Known distances of five echogenic target points embedded in a tissue mimicking phantom were compared with the two ultrasonic units equipped with 3.5/5.0-MHz and 7.5-MHz transducers respectively to determine relative machines error. The two ultrasound machines overestimated distances between target points ($P < 0.05$), with no set pattern, and no differences due to probe frequencies. It was visibly easier to measure the distances at higher transducer frequencies (5.0 and 7.5-MHz) due to increased attenuation. Split-split-plot ANOVA indicated differences in subdermal fat thickness (sfat) due to ultrasound machine, and week of lactation at all body sites ($P < 0.05$). At BCS of 2.58, least square means of sfat were: rib 5.2; loin 5.6; rump 5.5 mm; obtained with Modified Sonomed, and 6.0, 5.5, 5.3 mm at rib, loin, and rump respectively from Pie medical ultrasound. Regression of BCS from sfat along lactation showed significant R^2 values of .68, .69, .59, .79 for rib, loin, rump, and all body sites respectively, measured with Sonomed, and .36, .41, .33, .47 respectively with Pie medical. Digital ultrasonic scans of sfat at loin or rib sites of more cows with wider range of BCS should be further studied as potential sites for developing a portable, low cost, digitized, ultrasonic sensor for scoring body condition in dairy cows.

Key Words: Ultrasound, Subdermal Fat, Body Condition Score

1023 The effect of dietary forage sources on intake, milk yield, and body weight gain by Holstein cows in mid to late lactation. V. A. Wilkerson*¹, D. R. Mertens², B. P. Glenn¹, and J. S. Van Kessel¹, ¹*Nutrient Conservation and Metabolism Laboratory, USDA-ARS, Beltsville, MD and* ²*U.S. Dairy Forage Research Center, Madison, WI.*

Forages differ in their concentration of fiber thus altering the energy density of a diet when direct substitutions are made among forage sources. The objective of this study was to determine lactating cow responses when orchardgrass silage replaced alfalfa silage either at equal levels of dietary NDF or at equal dietary percentage in a TMR. Alfalfa silage (AS) and orchardgrass silage (OS) diets were formulated to contain 30% dietary NDF. Orchardgrass silage was directly substituted for alfalfa silage to obtain a third treatment (ROS) that contained about 35% dietary NDF. All diets were formulated to meet NRC recommendations using finely ground high moisture corn and a protein-vitamin-mineral supplement. Thirty-two mid to late lactation cows completed the 11-wk trial. Animals were individually fed once daily in an open free-stall barn equipped with electronically controlled feeders. Milk yields were similar for diets equal in NDF (28.0 kg/d for AS and OS, $P > 0.9$). The diet (ROS) containing more dietary NDF resulted in less milk yields (26.9 kg/d, $P = 0.11$) compared to the AS and OS diets. Dry matter intake was similar for diets equal in NDF (20.9 kg/d and 20.3 kg/d for AS and OS, respectively, $P > 0.3$), and the ROS diet resulted in intakes that were less (19.2 kg/d, $P < 0.02$) than intakes for the two diets similar in NDF. The reduction in milk yields and intakes suggest that less energy was available for milk production when more fiber was consumed per day. Production efficiency was greater ($P < 0.07$) for the orchardgrass silage diets (1.46 and 1.43 kg of milk/kg of DMI for OS and ROS, respectively) compared to the alfalfa silage diet (1.26 kg of milk/kg of DMI). Body condition score and animal weights were not significantly different among treatments throughout this study. Cows fed the OS diet gained the most body weight and cows fed the ROS diet gained the least body weight during the study (38.8 kg, 48.5 kg, and 29.8 kg for AS, OS, and ROS, respectively). Grass silages can be used in dairy diets when dietary NDF levels are applicable for cows in mid lactation.

Key Words: Dairy, Forage, Fiber

1024 USDA edible, red-blood cell based milk replacers do not potentiate the growth of selected bacteria *in vitro*. J. D. Arthington¹, T. L. Brown^{*2}, J. M. Campbell¹, E. M. Weaver¹, L. E. Russell¹, and F. Chi¹, ¹American Protein Corporation, Ames, IA, ²WTG Laboratories, Manhattan, KS.

Research has shown that USDA edible, red-blood cells (RBC-CMR) can replace more costly milk proteins without impairing growth performance of calves. Considering the inherent high iron levels of red blood cell protein, it has been suggested that this dietary strategy may potentially stimulate the growth of harmful enteric bacteria. Therefore, this study was conducted to compare the growth characteristics of selected bacteria when cultured with RBC-CMR or all-milk milk replacer (CMR). All-milk CMR (n = 4 samples) and RBC-CMR (n = 4 samples) were reconstituted to a final solution containing 12.5% solids. After reconstitution, 200 mL of each CMR was transferred into each of 4 bottles containing enteropathogenic *E. coli* (five strain mixture), *E. coli* 0157:H7, *S. typhimurium*, or negative control. Each bottle contained approximately 4.0 log cfu/mL of the appropriate pathogen. Bottles were then cultured under anaerobic conditions in a shaking water bath at 37° C. Samples were collected from each bottle at 0, 3, 6, 12, and 18 hours. Appropriate dilutions of samples collected at the various sampling times were plated in duplicate on selective media to enumerate the populations of the three pathogens or the natural microflora of the milk (negative control). The experiment was repeated 3 times for a total of 4 runs. At all sampling times the RBC-CMR had lower (P < .05) bacterial populations (natural microflora) compared to the all-milk CMR. No differences were observed for the growth of any of the selected pathogens at any of the sampling times. The growth rates and growth trends observed for enteropathogenic *E. coli*, *S. typhimurium*, and *E. coli* 0157:H7 were similar in both red blood cell and all-milk milk replacers. These protein sources do not differ in their ability to potentiate the growth of these selected pathogenic bacterial populations *in vitro*.

Key Words: Milk Replacer, Bacteria, Iron

1025 Bovine serum protein is a beneficial nutritional support therapy following coronavirus challenge. J. D. Arthington¹, C. A. Jaynes², and H. D. Tyler^{*2}, ¹American Protein Corporation, Ames, IA, ²Iowa State University, Ames.

The objective of this experiment was to investigate the therapeutic efficacy of feeding a supplemental bovine serum protein blend (LifeLine™) to calves challenged with virulent coronavirus. Twelve Holstein bull calves were allocated by initial body weight to Control (n = 7) and Treated (n = 5) groups. On d 0, all calves were orally challenged with 1 x 10⁷ PFU of virulent coronavirus isolate. Infection was allowed to progress for a period of 24 h prior to the initiation of treatment. On d 1, Treated calves began receiving 160 g of a BSP blend (16 g IgG) mixed into milk replacer powder (67 grams) at both the AM and PM feedings. Control calves received only milk replacer powder (227 g) at both feedings. Treatment improved (P < .05) average body temperature and animal attitude over the 7 d challenge period. Recovery from increased body temperature and diarrhea occurred nearly a day sooner in Treated calves, although these differences were not statistically significant. Dehydration, as measured by packed cell volume (PCV), was less prolonged (P < .01) in Treated calves (4.1 versus 6.4 days to baseline PCV for Treated and Control calves, respectively). The use of bovine serum protein, as a dietary supplement, decreases the severity of clinical responses to coronavirus challenge in young calves.

Key Words: Coronavirus, Calves, Serum Protein

1026 Bovine somatotropin does not compromise re-productive performance of Holstein cows. J. Luna Dominguez, University of Arizona, Tucson.

Some dairy producers resist using bovine somatotropin (bST) before 120 days postpartum because of the concern that fertility is compromised. Therefore, a trial was conducted to evaluate reproductive performance of Holstein cows in two high producing herds in Arizona and Southern California. Rolling herd averages for both herds for milk production exceeded 10,700 kg/year. Data were collected for cows calving December, 1996 through May, 1997. A total of 106 cows were used; 70 were multiparous, and 36 were primiparous. The voluntary waiting period was 60 days post-calving, with cows randomly assigned to receive bovine somatotropin (bST) or no treatment (controls). In the 180 day interval after calving, 77% (41/53) of the control cows were diagnosed pregnant. With the bST treated cows, 72% (38/53) were pregnant in that same interval. A Chi-square analysis indicated that conception rates did not differ significantly between treatment groups. Services per conception were similar for the two treatments. In conclusion, fertility of high producing Holstein cows was equivalent whether or not bST treatments were initiated according to label guidelines.

Key Words: Fertility, Somatotropin, Lactation

1027 Comparison of cooling systems to evaluate production performances and comfort of Holstein and Brown Swiss dairy cows during summer. A. Correa-Calderon*, D. V. Armstrong, C. M. Howison, S. K. DeNise, R. M. Enns, and D. E. Ray, Department of Animal Sciences, University of Arizona, Tucson.

To evaluate the effect of two different cooling systems on milk yield, milk composition and rectal temperature (RT), 37 Holstein and 26 Brown Swiss dairy cows were allotted into three treatments. A control group of cows had access to only shade (C). The second group was cooled with spray and fans (S/F) and the third group was under an evaporative cooling system called Korral Kool® (KK). The trial lasted for 18 weeks (May to September) with a maximum temperature-humidity index (THI) of 85 and an average maximum THI of 81. The minimum THI recorded was 56 with an average of 67. Milk production was recorded daily (a.m.-p.m.) And milk composition was analyzed every two weeks for protein, fat and somatic cell count. RT on all cows was taken three times per week at 4:00 p.m. Milk production for the Holstein cows was 33.3 (C), 35.0 (S/F) and 38.3 kg/d (KK). Difference was found among C and KK (P<.01), and S/F vs KK (P<.10). The milk yield between C and S/F was similar (P>.10). No differences (P>.10) on milk production were observed in Brown Swiss cows among treatments 30.4 (C), 30.8 (S/F) and 32.9 kg/d (KK). Protein percentage was only different (P<.05) among C 3.0% and KK 3.4% in Brown Swiss cows while % fat was different (P<.05) only between C 3.2% and KK 2.9% in Holstein cows. Somatic cell count was similar for the three groups in both breeds (P>.10). The lower RT observed in the cooled groups suggests increased comfort. For Holstein cows, RT of the C group 39.6 °C was higher (P<.01) than S/F 38.9°C and KK 38.8°C and S/F was similar to KK (P>.05). In Brown Swiss cows RT of C group was 39.1°C which is higher than S/F 38.9°C (P<.01) and KK 38.7°C (P<.05). These results demonstrate that both cooling systems are an alternative to increase milk production and the comfort of Holstein cows during summer. In Brown Swiss cows, even though cooled groups had a lower RT, milk production did not show any benefit to the cooling systems.

Key Words: Heat Stress, Cooling Systems, Milk Production

1028 Evaluation of Production String Sampling Methods. W. R. VerBoort^{*1}, G. E. Higginbotham², S. R. Taylor¹, and J Robison³, ¹*California DHIA*, ²*UCCE, Fresno/Madera Counties*, ³*California State University, Fresno*.

Three methods of sampling production strings (groups or pens) for large herd management purposes were analyzed. Methods used included two that sampled from the milk line. The first method collected a sample from the drain at the low point in the line (drip method). The other method used a hypodermic needle pierced through an envelope Teflon gasket (needle method). The third method pooled the milk that remained from the individual cow sample (bucket method). All results were compared to the weighted average of the production strings based on the individual cow samples. Six groups of cows at the California State University, Fresno dairy were sampled on both milkings for five days. The production strings consisted of twenty cows each. The samples were analyzed for butterfat, protein, lactose, solids-not-fat, somatic cell count, and milk urea nitrogen. The needle method generally showed a greater mean difference than the other methods. However, since the variability of the results was significantly less with the needle method (as measured by the standard deviation), it is the method most desired for measuring the differences in production string management.

Mean and Standard Deviation of Differences between Production String Sampling Methods and the Weighted Average of Individual Cows Comprising a Production String

Component	Drip		Needle		Bucket	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Butterfat (%)	-.002	.273	.035	.165	.042	.244
Protein (%)	.019	.109	.029	.092	.019	.145
Lactose (%)	.049	.120	.073	.115	.050	.119
SNF (%)	.069	.224	.105	.207	.074	.246
MUN (mg %)	1.30	1.80	1.30	1.50	0.90	1.20
SCC (× 1000)	5	46	7	41	9	55

Key Words: Sampling, Management, Large Herd

1029 Economic values for changing biological measures of dairy herd performance. M. Lunak^{*} and M. A. Faust, *Iowa State University, Ames*.

Objective was to determine the impact of change for profitability that was associated with biological characteristics of dairy herd performance. The data set studied included DHIA performance for 9,851 Holstein herds in Wisconsin. Profit score was the difference between estimated income and costs. Regression analyses were performed for each performance measure separately, thus derived coefficients estimated the economic value of direct and indirect effects of change for individual biological measures. Quadratic relationships with profit score were obtained for nine measures (DIM, Services per conception, Days from calving to first breeding, Percent cows bred > 3×, RHA, Percent cows in first lactation, Percent cows open > 120 days, Calving interval, Days dry) and linear functions for two measures (Age of first calving, and Percent cows with SCS > 5). For calving interval, mean was 410 days, but the most profitable interval from analyses of profit score was 393 days. The difference in profitability score between the average and most profitable calving intervals was \$7.52 annually per cow. For days from calving to first breeding, mean was 92 days, but the most profitable time from analyses of profit score was 66 days. The difference in profitability score between the average and most profitable days from calving to first breeding was \$12.56 annually per cow. In addition, average annual change attained for the biological measures by herds was computed using five data sets from Mid-States DRPC for 1990 to 1994. The mean and absolute changes for calving interval and days from calving to first breeding were 2.5, [19.6], and 0.87, [11.1], respectively, and the corresponding changes for profit score \$2.10, \$-29.65, \$7.16 and \$1, \$-13.1, \$8.6, respectively. Findings can be used to develop prediction equations for prioritizing management changes for biological performance in dairy herds.

Key Words: Regression Coefficient, Annual Change, Profitability

1030 Price sensitivity of marginal values for herd performance measures. M. Lunak and M. A. Faust^{*}, *Iowa State University, Ames*.

Objective was to determine the sensitivity of marginal economical values of change for biological measures of herd performance when prices were varied. The data set included DHIA performance of 9,581 Holstein herds in Wisconsin, and profit score for herds was estimated as income minus total costs annually per cow. Prices for milk, feed, and fixed cost were changed independently, and were ±10, ±15, ±20, and ±25% of base prices. Regression coefficients estimated the economic values of changes for biological measures, and were computed separately for biological measure-price change combinations (150 independent regression analyses). For all measures, regression coefficients derived from price sensitivity analyses did not differ from the base scenario. Greatest potential for improving profit score per cow was a change from mean to optimum for services per conception; least potential was for changes for percent cows bred > 3× (\$4.52). Mean services per conception were 1.82; highest score occurred when services were 2.13 in the base scenario, and the annual economic advantage for optimum services was \$14.72 in the base scenario. This result likely occurred due more services required in herds with higher RHA. Mean age at first calving was 26.6 months, and calving heifers 1 month earlier was expected to yield \$44.66 in the base scenario. When prices were varied for age of first calving, economic advantages ranged from \$36 to \$53 per cow. Findings suggest that changes for reproductive measures offer large economic incentive for management changes, and that relative economic importance of changes for different biological measures are not influenced by price change.

Key Words: Dairy, Profitability, Prices

1031 Effect of bovine somatotropin on body condition and milk yield in the first sixty days of the subsequent lactation. J. L. Vicini^{*}, R. J. Collier, T. L. Curran, P. K. Olsson, G. F. Hartnell, and S. C. Denham, *Monsanto Dairy Business, St. Louis, MO*.

One hundred thirty-two cows were assigned randomly within parity to four treatments as part of a larger study. Two treatments of commercial significance were bST at 0 or 480 mg/d. Treatments were initiated at 60 ± 3 days in milk and cows remained on bST until dry-off. Somatotropin was administered biweekly as the Ala⁻¹-Val¹²⁶ variant in a prolonged release formulation. All cows were started on a high-energy diet (1.7 Mcal NE_L/kg DM, 18% CP) and were switched to medium (1.6 NE_L, 15% CP) and low-energy diets (1.5 NE_L, 14% CP) as lactation progressed. Cows were identified for movement to lower energy diets based on milk production and moves were then actually made based on body condition scores. Milk yields during the treatment period were significantly elevated with bST treatment. Body condition scores at dryoff and freshening were not affected by treatments. Similarly, milk production in the first 60 days of the next lactation, prior to bST use, was not affected by prior treatment with bST.

Item	Control	bST
Parity = 1		
Lactation 1 with bST	29.3a	33.5b
Lactation 2 pre bST	42.2	42.4
BCS at Dryoff	3.5	3.1
BCS at Fresh	3.4	3.4
Parity = 2		
Lactation 1 with bST	28.1a	33.6b
Lactation 2 pre bST	38.2	38.9
BCS at Dryoff	3.8	3.6
BCS at Fresh	3.8	3.4

Milk production in the subsequent lactation was not affected by prior treatment with somatotropin.

Key Words: Somatotropin, BST

1032 Estimation of dairy response curves of indigenous cattle in West Africa: Bunaji cattle. K. Agyemang*, G. Tona, J. W. Smith, and A. Larbi, *International Livestock Research Institute, Ibadan, Nigeria*.

A multi-country study was initiated in 1996 to collate, and to generate data to estimate response to feed and health inputs in indigenous cattle to be used in input-output predictive models. Results on two experiments are reported. At ILRI Ibadan (Trial 1), 4 groups, each of 5 lactating Bunaji cows received 3.5, 4.5, 5.5 and 6.5 kg TDN of feed mixes of Lablab hay, cotton seed cake (CSC) and brewers spent grain (BSG) as full diet for 10 wk. At two on farm locations in Kaduna State, 5 groups, each of 11 cows received 0, 1, 2, 3, 4kg TDN/hd feed mixes of groundnut haulms, BSG and CSC as supplements to grazing natural pastures (Trial 2). Data from both trials were subjected to repeated measures analyses(RMA) and to polynomial analyses. In Trial 1, daily feed intake in the 4 groups averaged 5.6, 7.7, 8.4 and 9.3 kg/d. Results of the RMA showed significant effects ($P<0.001$) for time and interactions of time and treatment. Cows on 3.5 kg TDN attained a peak yield of 2.9 l/d at the end of first wk on and dropped off subsequently whereas cows on 5.5 kg TDN attained a peak yield of 4.1 l/d during the fourth wk. Polynomial orthogonal contrasts were significant only for linearity, with estimated least squares means (LSM) of 2.1, 2.0, 3.2, and 3.0 l/d (S.E = 0.59). In Trial 2, milk offtake for human use (MOF), calf daily gain (ADG), milk equivalent of growth (MEQ), and total yield, TOT (= MOF+MEQ) were significantly ($P<0.001$) influenced by time and time and treatment interaction. Polynomial contrasts showed that MOF was only significant at linearity ($P<0.05$), while ADG, MEQ and TOT were significant up to the quadratic component ($P<0.05$). LSM for TOT were 0.73, 1.76, 2.15, 2.13 and 3.36 l/d (S.E=0.235). Results suggest that on input output basis it may not be profitable to provide full feed greater than 5.5 kg TDN (approx. 9 kg, DM 20% CP) for Bunaji cattle in stall feeding schemes. On the other hand supplementary feeding rate up to 4 kg TDN/d for grazing cattle of average weight of 250 kg and producing about 3 l/d of milk (5% fat) would make economic sense.

Key Words: Response Curve, Cattle, Milk

1033 Evaluation of stocking rate, feeding system and calving season effects for a pasture based dairy farm. C. B. King*, G. A. Benson, B. D. Slenning, S. P. Washburn, and J. T. Green, *North Carolina State University, Raleigh*.

A computer simulation model, UDDER, was used to determine the optimum dairy farm design and management strategies for a grazing dairy herd. Simulations investigated the effects of changes in stocking rate, alternative concentrate feeding systems, and season of calving. Increases in stocking rate and the level of concentrates fed were predicted to cause large increases in the productivity and profitability. The effects of season of calving were predicted to depend on the level of concentrates fed. Spring calving was preferred when the feeding system used restricted the ability to deliver concentrates to the herd. Gross margin per cow and per hectare were maximized when high levels of highly metabolizable concentrates were fed, and season of calving was not an important consideration when this concentrate feeding strategy was used. Increases in stocking rate were predicted to increase herbage utilization, milk production, and gross margin per hectare. Gross margin per hectare was maximized when herbage utilization rates were very high, i.e., between 80 and 90 percent of annual herbage accumulation. The stocking rates required to achieve high herbage utilization rates and high profits also required high levels of concentrate feeding and larger quantities of conserved forages. These results challenge many popularly held opinions about pasture-based milk production systems. Specifically, the no or very low concentrate feeding levels that are representative of New Zealand were not the most profitable systems under a milk price and cost structure that is representative of the Mid- Atlantic region of the United States. The most profitable systems were not low input or low investment. Field research is required to validate the conclusions of the model simulations.

Key Words: Milk Production, Grazing, Economics

1034 A comparison of milk production and feed costs of pasture and confinement feeding systems with Holsteins and Jerseys and spring and fall calving. G. A. Benson*, J. T. Green, Jr., S. P. Washburn, and S. L. White, *North Carolina State University, Raleigh*.

A three-year applied research and demonstration project at the North Carolina State University dairy farm evaluated herd and financial performance characteristics of milking cows under various treatments. Herd performance of cows fed a silage-based diet in confinement was compared to that of cows on intensively managed pasture as the primary forage. Data were collected and analyzed on complete lactations for four groups of cows. There were approximately 36 cows in each group. Within each group of cows there were two breeds, Holstein and Jersey, to permit breed comparisons. Two of the groups were spring calving cows and two were fall calving cows. The confinement cows produced more milk than the pasture fed cows in all four lactation groups ($P<0.05$). The spring calving pastured Holsteins produced 16 percent less milk than the comparable confinement fed cows. The fall calving grazing Holsteins produced 9 percent less milk. For the Jerseys the differences were 9 percent less and 15 percent less, for the spring and fall calvers respectively. Within breeds, the percentage reduction in milk production was more pronounced for the spring calving pastured Holsteins and the fall calving pastured Jerseys. Season of calving had no impact on milk production levels for the confinement fed Holsteins and Jerseys or for the pastured Jerseys. For the pastured Holsteins, the spring calving cows produced 11 percent less milk than the fall calving cows. Feed costs were estimated for all groups and were lower for grazing cows in all lactations. These feed cost savings were insufficient to offset the lower levels of milk income. However, income over feed cost is an incomplete measure of financial performance and the profitability of any of the treatments was not determined. Other factors must be considered, including differences in labor costs, non-feed related operating expenses, investment costs, and animal health and longevity.

Key Words: Milk Production, Pasture, Seasonal Calving

1035 Reproduction, udder health and body condition scores among spring and fall calving dairy cows in pasture or confinement feeding systems. S. P. Washburn*, S. L. White, J. T. Green Jr., and G. A. Benson, *North Carolina State University*.

This multiple year study examined total lactation performance of dairy cows in two feeding systems; a pasture-based system (PASTURE) and a confinement system(CONFINE) using total mixed rations(TMR). The project had both Spring and Fall calving herds with breeding via artificial insemination in 75-day periods. Each seasonal herd replicate had 36 cows on PASTURE and 36 cows in CONFINE. Approximately equal numbers of Holsteins and Jerseys were included in each set. PASTURE comprised 30 ha of cool and warm season species in 36 paddocks for year-round grazing. PASTURE cows received variable amounts of grain and baled silage as needed depending upon pasture availability. CONFINE cows were housed in a covered freestall barn with access to an exercise lot and received a TMR with corn silage as the primary forage. Data were collected on reproduction, udder health, and body condition score and analyzed by GLM procedures in SAS. Seasonal group was the experimental unit for analyses across years (reproduction and mastitis) and cow was the experimental unit for analyses within season(body condition scores, somatic cell count scores). Reproductive performance of the CONFINE and PASTURE herds did not differ with an overall 75-day pregnancy rate of 71%. Jerseys in both systems did have higher ($P<.05$) percentages of cows inseminated (99.5%), conception (65%), and pregnancy (83.5%) compared to Holsteins (51%, 86%, 59% respectively). The percentage of cows infected with at least one case of clinical mastitis was higher ($P<.05$) in the CONFINE herd than the PASTURE herd (42.2% vs 22.8%) with Holsteins higher than Jerseys (41.1% vs 23.9%). Interactions of breed and feeding system and average somatic cell count scores were not significantly different. PASTURE cows had lower ($P<.05$)average body condition scores than CONFINE cows, ranging from 0.2 to 0.6 points lower on a 5-point scale.

Key Words: Pasture, Seasonal Reproduction, Mastitis

1036 The effect of fluid volume fed on the serum immunoglobulin in calves. C. S. Adams*, C. Y. Taugher, and P. W. Jardon, *Veterinary Medical Teaching and Research Center, Tulare, CA.*

Serum immunoglobulin in calves is highly correlated with the mass of immunoglobulin in colostrum fed in the first 24 hours of life. The immunoglobulin concentration of colostrum can be estimated by determining its specific gravity. When the specific gravity of colostrum is undetermined, feeding 3.78 L reportedly results in adequate serum immunoglobulin concentration. The objective of this study was to compare the serum immunoglobulin in calves fed the same mass of immunoglobulin in two volumes of fluid. Holstein calves < 6 hours old were randomly assigned to one of two groups, group 1 receiving 1.89 L colostrum, and group 2 receiving 1.89 L colostrum and 1.89 L whole milk. The colostrum was from a common batch, had a immunoglobulin concentration of 65 mg/ml, and fed via an esophageal feeder. Blood samples were obtained prior to colostrum feeding, 24 and 48 hours after, and serum total proteins (TP) were measured. The mean total proteins of the two groups were not significantly different at any time point during the study. The results indicate that fluid volume does not affect serum total protein when the same mass of immunoglobulin is fed to calves.

Volume fed	Mean TP time=0	Mean TP time=24	Mean TP time=48
1.89L	4.433	5.427	5.457
3.78L	4.507	5.350	5.625
p value	.54014	.56089	.54063

1037 Effects of supplemental BETA BOVIMIX® on milk composition and SCC in dairy cows. S. Bedö, E. Nikodémusz, and P. Póti*, *Gödöllő University of Agricultural Science, Gödöllő, Hungary.*

Fourteen Holstein Cows were fed BETA BOVIMIX® in concentrate at a daily dose of 21 g over three consecutive weeks. The product contained the following ingredients: Vitamin A - 380000 IU, Vitamin D₃ - 760000 IU, Vitamin E - 7600 mg, beta carotene - 6700 mg, Cobalt - 480 mg, Manganese - 76000 mg, and Iodine - 270 mg per kg. Cows were in mid to late lactation and fed a conventional concentrate fodder diet. Feeding BETA BOVIMIX® resulted in a significant increase of Vitamin A ($P \leq 0.001$), total carotene ($P \leq 0.05$) and Vitamin E concentrations ($P \leq 0.05$) of milk. Of solid components of milk, only fat percentage was temporarily increased in milk, probably due to the stimulating effect of Vitamin A and/or Cobalt and Iodine contents of BETA BOVIMIX®, whereas milk protein and lactose levels, as well as concentrations of Co and Mn, seemed to be unaffected. At one month post-treatment, the variables returned to normal levels. However, the somatic cell count rose temporarily in milk ($P \leq 0.01$) parallel to a significant increase in the proportion of the circulating leukocytes ($P \leq 0.01$). The phenomenon might be related to the immune stimulating effects of Vitamin A and E or to the interactions of the active ingredients BETA BOVIMIX®. In conclusion, the dietary administration of BETA BOVIMIX® is recommended to supplement cows' diet prior to calving.

Key Words: BETA BOVIMIX®, Milk Composition, SCC

1038 Metabolic and production responses to protein supplementation and exogenous somatotropin in prepartum dairy cows. D. E. Putnam*, G. A. Varga, and H. M. Dann, *Pennsylvania State University.*

Forty three multiparous Holstein cows were used in a completely randomized design to evaluate the effects of protein supplementation and use of bST in late gestation on periparturient dairy cow metabolism and productivity. Treatments were initiated 28 d prior to expected calving date, and continued through parturition. Diets fed contained either 13.3 or 17.8% protein, and were formulated to be similar in profile of protein fractions. Exogenous somatotropin (POSILAC) was administered at 14 d intervals beginning 28 d prepartum and continuing until parturition. Glucose kinetic measurements were performed on d 10 prepartum. Following parturition, all animals were subjected to the same management and dietary treatments with production followed until 42 days in milk. Significance was declared at $P \leq .10$; all results presented are significant unless otherwise stated. The use of POSILAC increased plasma glucose and decreased beta-hydroxy-butyrate (BHBA) prior to calving. In particular, cows treated with bST had elevated glucose and lower NEFA and BHBA immediately prepartum. The use of POSILAC decreased disposal rate and increased recycling of glucose. Feeding the 17.8% protein diet tended to elevate BHBA in late gestation, while increasing glucose disposal rate and decreasing residence time. Pre- and postpartum liver fat and triglycerides were not effected by treatments. Cows treated with POSILAC produced 3.3 kg/d more milk than control cows across the first 42 d of lactation, with the difference being 4.6 kg/d in week six of lactation. The use of bST in late gestation positively altered cow metabolism in late gestation and milk production postpartum.

Key Words: Somatotropin, Glucose Kinetics

1039 Quantifying normal variation in daily milk weight and dry matter intake for statistical process control purposes. A. de Vries* and B. J. Conlin, *University of Minnesota, St. Paul.*

Variation in milk weight and dry matter intake are important measures in dairy herd management. Statistical process control (SPC) methods distinguish between normal variation and variation due to special causes. Quantification of residual normal variation around the expected value is important for many SPC methods. Objective of this study was to compare models to predict individual daily milk weight and herd dry matter intake and to quantify the residual normal variation. Individual daily milk weights and daily dry matter intakes were obtained from 49 dairy cows for days 3–150 post partum. Observations were adjusted for known and special cause variation to obtain accurate estimates of residual normal variation. Series of models were fitted to predict milk weights and dry matter intake from milk weights and/or dry matter intakes from previous days. Residuals were winsorized to obtain estimates of normal variation that are free of special cause effects. Estimates of residual normal variation of individual daily milk weights were the smallest and similar for all models that contained a moving average milk weight. Estimates of winsorized individual standard deviations averaged 3.4 ± 0.9 kg (range 2.2–5.5 kg). Estimated standard deviations remained constant over the lactation period. Winsorization deflated estimates on average 8%. Adjustment for dry matter intake resulted in a statistical but not biological important reduction in milk weight variation. Herd dry matter intake was best predicted and similar for all models that contained a moving average herd dry matter intake. Estimates of winsorized standard deviations were on average 0.9 kg. Winsorization deflated estimates on average <1%. We conclude that individual estimates of normal variation in daily milk weights are a prerequisite for successful application of SPC methods to monitor individual milk weights. Simple autoregressive models suffice to predict milk weights and herd dry matter intake.

Key Words: SPC, Milk Weight, Dry Matter

1040 Evaluating Texel, Suffolk and Columbia sired offspring under a forage based lambing system. A. Ali*, D. G. Morrical, and M. P. Hoffman, *Iowa State University, Ames.*

A terminal sire study was conducted to evaluate production traits of Texel sired offspring compared to Suffolk and Columbia offspring in a pasture lambing system. Polypay X Dorset crossbred ewes were mated to Texel, Suffolk or Columbia rams for two 35-day breeding seasons during December 1992 and 1993. The ewes were wintered outdoors on average quality alfalfa hay fed at a level to meet their NRC requirements. The ewes were not fed any concentrate during late gestation or lactation. A total of 279 lambs were born with an average of 1.7 lamb per ewe. Birth weight (BW), weaning weight (WW) and 60 days age-adjusted weaning weight (Adj-WW) of lambs sired by Texel rams were 5.28, 24.49 and 18.40 kg, respectively and were comparable to lambs sired by Suffolk rams (5.40, 24.66 and 18.38 kg, respectively). These values were greater ($P < .05$) than lambs sired by Columbia rams (4.72, 21.95 and 16.21 kg, respectively). Pre-weaning average daily gains (ADG) for lambs also showed a similar trend ($P < .05$). The ADG was 238.35, 236.97 and 208.87 g, respectively, for lambs sired by Texel, Suffolk or Columbia rams. However, survival rate (SR) of 68.23, 80.25 and 67.23% for lambs sired by Texel, Suffolk or Columbia rams did not differ significantly. It was concluded that Texel rams, used in a forage-based production system, sired offspring that performed equal to those of Suffolk sires and better than those sired by Columbia rams. However, Texel sired offspring did not excel in livability as reported in literature. In addition, the triplet-born lambs had extremely poor BW, Adj-WW and SR (4.29 and 15.32 kg and 59.05 %, respectively) as compared to single-born lambs (5.89 and 20.92 kg and 90.71 %, respectively) which indicated that highly prolific ewes might not be suitable for pasture lambing systems such as this one.

Key Words: Texel, Suffolk, Production Traits

1041 Long term performance of passive injectable transponders in sheep on practical field conditions. R. Nehring*, G. Caja, O. Ribó, C. Conill, and D. Solanes, *Universitat Autònoma de Barcelona, Bellaterra, Spain.*

A total of 5,907 Ripollesa sheep in 9 farms were identified using 32mm PITs (passive injectable transponders; Tiris, Texas Ins., Almelo, NL) during 4 years (1994-97). The PITs were injected in the right armpit (A; $n=4,854$) or ear-base (EB; $n=1,053$) and the readability and the reading efficiency (static and dynamic methods) were recorded twice a year. Static reading efficiency (SRE) was evaluated using two different hand-held readers (Gesreader I, Gesimpex Com., Barcelona, ES; and Portoreader, Insentec, Marknesse, NL). Dynamic reading efficiency (DRE) was evaluated, using two models of transceivers (S-1000 and S-2000, Gesimpex Com.) at different field strength (137 and 140 $\text{db}\mu\text{V/m}$, respectively), with animals walking through a race-way (0.4m width) with a 94x52cm frame antenna (Tiris) installed at its right side. Readability was higher in A (97.8%) than in EB (92.8%), mainly due to higher losses (1.7 vs 4.7%) and breakages (0.3 vs 2.5%) found in EB ($P < 0.05$). Low electronic failures of PITs (0.15%) were observed in both injection sites ($P > 0.05$). The SRE was 100% in all tests performed. Nevertheless, DRE varied according to transceiver and injection site, the S-2000 (A, 100%; EB, 97.5%) showing higher values than S-1000 (A, 99.9%; EB, 94.2%). Recovery of transponders by farmers in a total of 2,059 culled or dead ewes (EB, 482 ; and A, 1,577) was also studied. Overall, 137 sheep injected in A (2.8%) and 13 injected in EB (1.2%) were not slaughtered under test conditions and the PITs were lost. Among those retrieved in EB most (>80%) were located by palpation, but up to 6% showed migration away from the injection site. Migrated transponders from EB were found in the first vertebrae of the neck or behind the base of the mandible. In A most PITs were located by sight or palpation (>95%) and less than 1.3% showed migration. Migrated PIT from A were found between the third and fifth ribs and in the internal face of the foreleg. In conclusion injection in the armpit showed the highest reading performance and lowest recovery draw-backs, compared to the ear base, but precautions needed to be taken to ensure the complete removal of PIT in culled ewes.

Key Words: Electronic Identification, Injectable Transponders, Sheep

1042 Prediction of cashmere style using objective fiber measurements. C. J. Lupton*, F. A. Pfeiffer¹, and A. R. Dooling², ¹*Texas Agricultural Experiment Station, San Angelo* and ²*Pioneer Mountain Farm, Dillon, MT.*

Fiber measurements were made on 25 raw cashmere samples (5 of each style score [1-5] from Cashmere goats) to establish a mathematical relationship between the objectively determined characteristics and cashmere style (CS) subjectively assessed by an expert cashmere classifier. Cashmere style is considered to be related to frequency, magnitude, and plane of fiber crimp and is an important factor in establishing cashmere identity and value. Skill in consistently assessing style is obtained only by intensive training. Measurements included cashmere down yield (DY), average fiber diameter (AFD), guard hair length (GHL), down length (DL), fiber (2mm in length) curvature (FC) and SD of FC. The AFD and FC were measured concurrently using an Optical Fibre Diameter Analyser. Cashmere style was significantly correlated with AFD ($r = .53$, $P = .006$), GHL ($r = .42$, $P = .036$), DL ($r = .42$, $P = .036$), and FC ($r = -.74$, $P = .0001$) but not with DY ($P = .27$). Stepwise multiple linear regression analysis for dependant variable CS resulted in only FC and SD of FC entering the model at the .1 significance level producing an $r^2 = .64$. A second set of 25 raw cashmere samples was measured in the same manner and FC was used to predict CS. For actual versus predicted CS, $r^2 = .63$ with a SE of prediction = .84 (cashmere style score units). Fiber curvature is the best single objectively measured trait for predicting style of cashmere and should provide a useful and more consistent alternative for assessing this important trait.

Key Words: Cashmere, Style, Objective Fiber Measurements

1043 Early growth of Boer x Angora, Boer x Spanish, and Spanish goat kids. J. Luo*, M. Cameron, and T. Sahl, *E (Kika) de la Garza Institute for Goat Research, Langston University, Langston, OK.*

Boer x Angora (BA; $n = 21$), Boer x Spanish (BS; $n = 30$), and Spanish (S; $n = 26$) male kids were used to compare early growth of Boer crossbred with Spanish goats. Kids were removed from their dams 3 d postpartum and fed goat milk for 2 wk followed by 1.14 kg milk replacer (11.4% DM; 24% CP and 32% fat, DM basis) until weaning at 8 wk. A commercial starter diet (22% CP and 2.8% fat, DM basis; 70% DM digestibility) was consumed ad libitum through 16 wk of age; castration was after 12 wk. Body weight after 2 wk was greater ($P < .05$) for crossbred vs S goats (4.33, 4.21, and 3.84 kg for BA, BS, and S, respectively). Average daily gain during the milk replacer period (71, 76, and 64 g for BA, BS, and S, respectively) was greater ($P < .05$) for BA and BS than for S goats. Likewise, ADG (137, 135, and 106 g) and DMI (331, 348, and 265 g/d) during the starter diet period were greater ($P < .05$) for BA and BS vs S, although gain:DMI was lower ($P < .05$) for BS than for BA and intermediate ($P > .10$) for S (.462, .398, and .423 for BA, BS, and S, respectively). In conclusion, differences in ADG between Boer crossbreds and S goats were greater during wk 9 to 16 with starter diet consumption than earlier with milk replacer (wk 2 to 8), and ADG of different Boer crossbreds when young may not differ markedly.

Key Words: Growth, Boer Goat, Spanish Goat

1044 Use of mimosine to induce cashmere shedding in goat. A. J. Litherland*, R. Puchala, C. Toerien, and T. Sahlu, *E (Kika) de la Garza Institute for Goat Research, Langston University, Langston, OK.*

The objective of this experiment was to determine if mimosine treatment of goats at the winter solstice induces shedding of cashmere but not guard hair. Twelve adult cashmere wethers (45 ± 2 kg BW) were continually infused for a 72-h period on December 9, 16, or 23, 1996 (four goats per day), with mimosine (100 mg/kg BW) or saline (C). Primary and secondary follicle activities (FA) on d 0 were 33 ± 8 and $78 \pm 7\%$, respectively. On d 8, cashmere had been shed in three of the six mimosine-treated goats; thus, fiber data were collected from three goats infused with mimosine (M) and from six C goats. Day-8 secondary FA was lower (0 vs 69%; $P < .001$) and cashmere shedding score (SS; 5-point scale, 1 = no shedding, and 5 = excessive shedding) was greater (5.0 vs 1.1 ; $P < .001$) for M than for C. On d 14, cashmere length was shorter (3.0 vs 8.6 cm; $P < .01$) and guard hair SS was greater (2.3 vs 1.0 cm; $P < .001$) for M compared with C goats. Cashmere yield from M goats was 34 ± 3 , 85 ± 4 , and $3 \pm 1\%$ for pre-combed, combed, and post-combed fleeces, respectively. In January and February, secondary FA (> 98 vs 37 to 52% ; $P < .05$) and cashmere growth rate (i.e., based on length of nonshed fiber) 1.10 vs $-.22$ mm/d; $P < .05$) were greater for M vs C goats. Over the January to April period, cashmere SS was lower ($P < .01$) for M than for C goats (1.13 vs 1.55). The guard hair fleece was 1 cm shorter ($P < .05$) for M compared with S goats in February and March. In conclusion, M was effective at removing cashmere in 50% of the goats treated; secondary FA in cashmere-shedding goats was increased by M, which led to additional cashmere growth.

Key Words: Cashmere Goat, Mimosine, Shedding

1045 Interspecific hybridization of farmed axis deer with fallow deer: An attempt using artificial insemination and associated hormonal profiles post-breeding. S. Willard*, J. Jaques², D. Neuendorff¹, G. Flores-Foxworth², M. Drew², J. Hill², S. Chapman², M. Westhusin², and R. Randel¹, ¹TAES-Overton, TX, ²Texas A&M University, College Station.

Axis deer exhibit a number of desirable production characteristics, but are susceptible to a higher degree of handling-related injuries than other farmed deer. The objectives of this present investigation were to try and hybridize axis deer with the more easily domesticated fallow deer, and to characterize the hormonal changes that occur post-breeding. To this end, axis ($n=16$) and fallow ($n=38$) does each received an intravaginal progesterone (P_4)-releasing device (CIDR) for 14 d. Axis does were then artificially inseminated (AI) with semen obtained from fallow bucks, and fallow does inseminated with semen obtained from axis bucks. Blood samples for analysis of serum concentrations of P_4 and estrone sulfate (E_1S) were taken at CIDR removal, d of AI and through d 42 post-AI; at which time pregnancy status was determined by ultrasonography (US). Our findings, as determined by US and hormone analysis, indicated that the reciprocal AI of axis and fallow deer did not result in any hybrid pregnancies. These data, as well as the absence of hybridization reports among free-ranging populations, suggest that hybridization between these two species is highly unlikely. As a follow-up to this study, same species clean-up sires were placed with the does for a 60-d breeding season, following d 35 post-AI, and resulted in a 93.8% and 89.5% pregnancy rate for axis and fallow does, respectively. In addition, serum samples from axis does were also obtained at 14-d intervals through d 103 after buck introduction to examine the use of serum P_4 and E_1S as methods for pregnancy detection in this species. For does with known breeding dates, serum concentrations of P_4 were similar ($P > .10$) regardless of d of pregnancy post-breeding, and were similar ($P > .10$) to peak concentrations of P_4 in nonpregnant does. In contrast, serum concentrations of E_1S were non-detectable prior to breeding, but increased ($P < .05$) more than 16-fold after d 43–46 post-breeding. These data suggest that E_1S may be utilized in axis deer as a method for pregnancy detection.

Key Words: Axis Deer, Hybridization, Pregnancy

1046 Effect of mature size on weaning performance and lactation parameters in goats under a meat production system. S. Wildeus*¹ and J. M. Fernandez², ¹Virginia State University, Petersburg, and ²Louisiana State University Agricultural Center, Baton Rouge.

Lactation and weaning performance was evaluated in 4 breeds of multiparous, spring-kidding does ($n=10$ /breed; body condition: 2.6, 5-pt scale) in a forage-based meat production system: Nubian (N; 50.6 kg), Spanish (S; 38.0 kg), Myotonic (M; 29.7 kg), and Pygmy (P; 18.6 kg). Birth and weaning weights were recorded and milk production determined at wk 4 and 9 (weaning) of lactation. Milk was collected through hand milking following oxytocin administration (1 UI, iv), yield recorded, and composition determined by standard DHIA procedures. Blood plasma for metabolite analysis was collected prior to milking. Breed effects were analyzed before and after adjustment for doe BW, with d of lactation as covariate. Litter birth weight was lower ($P < .001$) in P (2.35 kg) than the other breeds (M: 4.55 kg, N: 5.35 kg; S: 5.49 kg), but differences were not significant after adjustment. Litter weaning weight was lowest ($P < .01$) in P (5.3 kg), however, M (11.4 kg) was lower ($P < .05$) than N (15.9 kg) and S (17.8 kg). Adjustment eliminated differences between N and M. Milk yield was highest ($P < .05$) in N (1695 g), followed by S (1453 g), M (871 g), and P (437 g), reflecting mature size. Adjustment reversed the order for N and S, and N were similar to M. Milk fat (5.29%) and lactose (5.27%) were not affected by breed, but milk protein was higher and solids lower ($P < .01$) in the smaller breeds (P: 3.65 and 9.71%; M: 3.63 and 9.35%) than the larger breeds (N: 2.98 and 8.49%; S: 3.25 and 8.96%). Plasma glucose (2.79 mM) and urea N (9.9 mM) were not different between breeds, but P had lower (289 μ M; $P < .05$) NEFA than the larger breeds (N: 487 μ M; S: 677 μ M). The results indicate a greater efficiency for weaning weight and milk yield per unit BW in the moderate size breeds (M and S), however, breed-associated nutritional requirements have to be evaluated further.

Key Words: Meat Goats, Mature Size, Production Efficiency

1047 Determining the carcass composition of wethers by 40 potassium emission detection. K. J. Rozeboom*, M. G. Thomas, R. J. Lipsey, and D. H. Keisler, *University of Missouri, Columbia.*

The chemical carcass composition of 66 wethers ranging in weight from 6.1 to 48.6 kg was estimated from ⁴⁰potassium emissions and flame photometry. Lambs were slaughtered at five endpoints (28, 73, 118, 135, and 150 d of age) and ⁴⁰potassium detection by a Whole Body Counter (WBC) was performed 24 h prior to slaughter. Carcass weight (CW) and linear carcass measurements were recorded 48 h postmortem and the right side of each carcass was ground, sampled, and chemically analyzed by AOAC methods for percentages of fat (PFAT), protein (PPRO), water (PWAT), and potassium (PCCK). Percentage of fat-free mass (PFFM) and percentage of boneless, closely-trimmed retail cuts (PBCTRC) was determined. Linear regression equations were developed to predict PWAT, PFAT, PPRO, PFFM and PBCTRC. Whole Body Counter live animal potassium and chemically determined carcass potassium by flame photometry were used as independent variables. Significant relationships ($P < .01$) existed between all independent and dependent variables excluding percentage of live animal potassium detected by the WBC and PBCTRC. Grams of potassium estimated by the WBC was highly correlated to grams of chemically determined carcass potassium ($r = .94$, $P < .01$). Live weight (LW) and ⁴⁰potassium emission detection from the live lamb accounted for more variation in PWAT ($R^2 = .86$, $CV = 2.62$), PFAT ($R^2 = .76$, $CV = 14.92$), and PFFM ($R^2 = .86$, $CV = .86$) than CW and chemically determined carcass potassium. However, PBCTRC was better predicted by CW and chemical carcass potassium than LW and ⁴⁰potassium emission detection ($R^2 = .63$, $CV = .95$ vs $R^2 = .41$, $CV = 1.16$). This research indicates that ⁴⁰potassium detection can be used as an accurate non-destructive method of predicting carcass composition wether of lambs over a wide variety of weight. Work supported in part by USDA Postdoc Grant 95-37206-2119.

Key Words: Potassium, Carcass Composition, Lamb

1048 Serum LH after a GnRH challenge as an indicator of time of puberty in young Debouillet ewe lambs. K. L. Shirley*, D. M. Hallford, M. G. Thomas, J. A. Hernandez, C. C. Rasor, J. B. Richards, and H. J. Al-Tamimi, *New Mexico State University, Las Cruces*.

Twenty-nine Debouillet ewe lambs (50 ± 5 kg, 159 to 187 d of age) were used to evaluate LH response to a GnRH challenge as a tool in determining time of puberty. Ewe lambs were born in March, weaned at an average of 60 d of age and fed pelleted alfalfa and cracked corn at 30% of their pellet intake throughout the summer. On Sept. 15, each ewe received 10 μ g of GnRH (i.v., Cystorelin). Blood was collected before and at 30-min intervals for 2 h after GnRH injection. Serum LH was measured in these samples and area under the response curve (AUC) was calculated. Additional blood samples were obtained twice weekly through Nov. 14 and serum progesterone (P_4) was determined. The day on which serum P_4 was first measured above 1 ng/mL for 2 consecutive samples were recorded as day of puberty. Average Julian day of puberty was calculated (Oct 12) and ewes with lower and higher values were considered to have reached puberty early or late, respectively. Average BW was calculated and ewes weighing less or more were considered as light or heavy, respectively. Ewes reaching puberty early tended ($P=.14$) to have greater LH AUC (895 ± 93 units) than did those that reached puberty late (718 ± 73 units); however, this tendency was not observed when BW was used as a covariate (799 and 777 ± 105 units, respectively; $P=.88$). Heavy ewe lambs reached puberty on Oct 5 ± 3 d compared with Oct 20 ± 3 d for lighter ewes ($P<.01$). Likewise, heavy ewes had greater LH AUC than did lighter ewes (895 and 667 ± 80 units, respectively; $P=.05$). Correlation coefficients between BW at the time of GnRH injection and date of puberty and LH AUC were $-.53$ ($P<.01$) and $.42$ ($P<.05$), respectively; while the r value between day of puberty and LH AUC was $-.27$ ($P=.16$). Prepubertal LH response to GnRH does not appear to be as reliable an indicator of time of puberty as BW.

Key Words: Puberty, Sheep, GnRH

1049 Litter traits and growth characteristics for lambs from Rambouillet, Romanov-Rambouillet, and Dorset-Rambouillet ewes. D. S. Buchanan*, G. Q. Fitch¹, S. Erat¹, and W. Phillips², ¹Oklahoma State University, Stillwater and ²USDA-ARS Grazinglands Research Laboratory, El Reno OK.

Rambouillet, Romanov-Rambouillet and Dorset-Rambouillet ewes ($n=178$, 217 and 208, respectively) were compared for use as dams of crossbred lambs. Ewes were mated to Suffolk or Hampshire rams and lambs were born during a fall lambing season during three consecutive years. Ewes were maintained on wheat pasture with minimal supplementation from lambing to weaning. Lambs were offered a creep ration and were weaned at approximately 90 days. Litter size and litter weight at birth and weaning, and lamb birth and 90-day weight were analyzed with a model that included ewe breed, year, age of dam and all two-way interactions. Sex and appropriate interactions were included for birth weight and 90-day weight. Ewe breed means (Rambouillet, Romanov-Rambouillet and Dorset-Rambouillet) were: litter size at birth (1.28, 1.56, 1.64 lambs), litter size at weaning (1.15, 1.43, 1.39 lambs), litter weight at birth (6.21, 6.46, 7.45 kg), litter weight at weaning (36.3, 38.0, 41.0 kg), lamb birth weight (4.84, 4.00, 4.65 kg) and lamb 90 day weight (28.3, 25.6, 28.9 kg). There were significant ($P<.05$) differences between ewe breeds for litter size at birth and weaning (Rambouillet vs Romanov-Rambouillet and Dorset-Rambouillet), litter weight at birth and weaning (Dorset-Rambouillet vs Rambouillet), birth weight (Rambouillet vs Romanov-Rambouillet) and 90-day weight (Romanov-Rambouillet vs Dorset-Rambouillet and Rambouillet). These results show an advantage for crossbred ewes for prolificacy but a disadvantage in weight at 90 days for the lambs from the Romanov-Rambouillet ewes.

Key Words: Sheep, Breeds, Performance

1050 Reproductive and endocrine characteristics of ewes treated with propylthiouracil during gestation. H. J. Al-Tamimi*, D. M. Hallford, F. A. Schneider, L. A. Donovan, J. A. Hernandez, and J. B. Richards, *New Mexico State University, Las Cruces*.

Twenty-eight mature, pregnant Debouillet ewes (avg. BW=84 kg) were assigned to four treatments (7/group) to examine effects of the goitrogen 6-n-propyl-2-thiouracil (PTU) when administered at 5 mg/kg BW beginning about 60 d before parturition (d 0, Jan 23). A control group (CON) received blank gelatin capsules daily (gavage) for 20 d. Seven ewes received PTU for 10 d then blank capsules for 10 d (10E). A third group received blank capsules for 10 d then PTU for last 10 d (10L). The fourth group received PTU for the entire 20-d treatment period (20D). During the first 10-d period, serum thyroxine (T_4), declined ($P<.10$) in treated (10E and 20D) groups from d 6 through 9 compared with CON. Through the second 10-d period, the 20D group had lower ($P<.05$) T_4 (in the 20 ng/mL range) than did other treatment groups. Concentrations of T_4 returned to control values in the 10E ewes by d 14. After terminating PTU treatment (d 20), T_4 values were comparable ($P>.10$) in all groups by d 25. Ewe BW did not differ ($P>.40$) among groups. Likewise, lamb BW through weaning was similar ($P>.40$) in all groups. No differences ($P>.15$) in milk weight or milk constituents were detected among groups on d 21 postpartum (PP). Serum LH on d 7 PP was similar ($P>.40$) in ewes receiving CON, 10E, 10L, and 20D treatments (.65, .49, .46, and .46 $\pm .06$ ng/mL, respectively). Likewise, number of LH pulses/6 h were comparable ($P>.50$) among all groups on d 7 PP. However, on d 14 PP, CON ewes had greater ($P<.09$) basal LH than did ewes in the other groups, but number of pulses/6 h did not differ ($P>.30$) among treatments on d 14 PP. None of the ewes cycled during the 30-d postpartum period as evidenced by no serum progesterone values above 1 ng/mL. PTU effectively lowered serum T_4 without adverse effects on the ewe or lamb but with no resumption in LH pulsatility.

Key Words: Reproduction, Sheep, Thyroxine

1051 The use of bovine serum protein as a supplement to colostrum for newborn lambs. A. Weddle*, M. K. Neary¹, G. R. Kelly¹, and J. D. Arthington², ¹Purdue University, West Lafayette, IN, ²American Protein Corporation, Ames, IA.

The objective of this experiment was to investigate the influence of bovine serum protein as a source of supplemental IgG for newborn lambs. Newborn twin lambs were collected from ewes during both the spring and fall lambing seasons ($n = 10$ ewes / season). Following birth, twin lambs were separated from their respective dams and enough colostrum was milked to produce four equal 60 mL feedings. Two treatments were then randomly allocated within the twin lambs. Treated lambs received 50 grams of bovine serum protein (BSP) while control lambs received 50 grams of a non-medicated milk replacer powder. Treatments were delivered in an 80 mL fluid feeding both prior to and following a 60 mL feeding of ewe colostrum. To measure the absorption and subsequent clearance of bovine IgG, blood samples were collected at 0 h (prior to treatment administration), 24 h, 72 h, 7 d, and 14 d. Serum was harvested from fresh blood via centrifugation and stored frozen until later IgG analysis using a turbidometric assay system. Individual lamb weights were collected weekly for 4 weeks. Oral administration of BSP resulted in a significant ($P < .01$) increase in the concentration of bovine IgG in the blood of treated lambs at 24 h (0.20 mg/mL), 72 h (0.18 mg/mL), and 7 d (0.15 mg/mL). By the 14 d sampling period bovine IgG was nearly undetectable in Treated lambs. There was no treatment effect on lamb weight at any of the weighing dates. However, treated lambs experienced an increased ($P < .05$) overall gain by the end of the four week sampling period (5.25 and 6.09 kg of gain for Control and Treated lambs, respectively). The use of bovine serum as a supplement to ewe's colostrum results in a transient rise in bovine IgG diminishing by about 14 d of age. This response was also associated with an improvement in lamb growth performance over the first four weeks of life.

Key Words: Lamb, IgG, Colostrum

1052 Performance of growing Spanish x Boer kids as influenced by gender and age. M. Cameron^{*1}, T. Sahlul¹, C. Gilchrist¹, S. Hart¹, and S. Coleman², ¹*E (Kika) de la Garza Institute for Goat Research, Langston University, Langston, OK*, ²*USDA/ARS Grazinglands Research Lab, El Reno, OK*.

Sixty Spanish x Boer kids (20 intact males, castrates, and females) were utilized (3 x 5 factorial) to investigate the effects of gender and age on growth performance. Kids were weaned at 10-wk and offered increasing amounts of a starter diet (72% TDN, 3.12 Mcal/kg DE, 20% CP, and 21% ADF) for adaptation to concentrate. After 14-d, kids were placed in individual metabolism crates. After 7-d for adjustment, the experiment was initiated. Kids averaged 16.4 kg and 93-d of age; treatments were balanced for birth and weaning weight, age, and litter size. Kids consumed ad libitum a corn-based concentrate (80% TDN, 3.6 Mcal/kg DE, 18% CP, and 12% ADF). Twelve kids (four per gender) were slaughtered initially and at 8-wk intervals for a total of five slaughters. Performance results at 21, 29, 36 and 45-wk of age are as follows. Dry matter intake (519, 550, 717, and 727 g/d) increased linearly ($P < 0.001$) with age. Average daily gain (113, 98, 139, and 126 g/d) and feed to gain (F/G) (4.77, 6.32, 5.22, and 5.88) responded to age in a cubic fashion ($P < 0.003$). Intact males and castrates had greater ($P < 0.01$) DMI than females (675 vs 533 g/d); males had the greatest ($P < 0.001$) ADG and were the most efficient ($P < 0.004$) (ADG: 143, 121, and 93 g/d; F/G: 4.80, 5.93, and 5.91 for males, castrates, and females, respectively). When expressed as a percentage of BW, males had the lowest ($P < 0.03$) DMI (2.01, 1.98, and 1.89% for castrates, females, and males, respectively). DMI, as a percentage of BW, decreased ($P < 0.01$) linearly and quadratically with age (2.34, 2.00, 1.85, and 1.66%, respectively); females and castrates exhibited the greatest rate of decline ($P < 0.03$). No significant gender x age interaction ($P > 0.05$) was observed for DMI (g/d), BW, ADG, or F/G. In conclusion, results are indicative of a performance advantage for intact males.

Key Words: Goat, Nutrition, Growth

1053 Effects of zeranol on growth and reproductive performance of ewe lambs. B. W. Hess^{*}, R. V. Lewis, R. H. Stobart, and G. E. Moss, *University of Wyoming, Laramie*.

Sixty Rambouillet x Columbia ewe lambs (initial BW = 29.4 ± .05 kg) were used to evaluate the effects of zeranol implants on growth performance and estrous activity under drylot conditions. Lambs were randomly assigned to experimental treatment (10 ewes/pen with 3 pens/treatment) according to initial BW. Treatments were no implant or one zeranol implant (12 mg of Ralgro[®], Mallinckrodt Vet) at the beginning of the study. Body weights were obtained on d 21, 42, 63, and 84 of the growth trial. Lambs had ad libitum access to bromegrass hay (CP = 9%, NDF = 63.2%, ADF = 39.7%) and were fed a daily supplement formulated for gains of .23 kg/d. Hay refusals were collected and weighed each time body weights were taken. At the conclusion of the growth trial, two vasectomized rams fitted with marking harnesses were placed in a large pen with all of the ewe lambs. Vasectomized rams remained with the ewe lambs for 28 d. Growth performance data (21 d intervals and cumulative effects) were analyzed as a randomized complete block design. Estrous activity was analyzed via a two-tailed T-test. Forage intake did not differ ($P > .30$) between treatments for any of the 21 d intervals; however, ewes implanted with zeranol consumed 1.9 kg more ($P = .04$) hay over the 84 d trial. Ewe lambs implanted with zeranol were heavier ($P < .06$) from d 42 through 84, resulting from a cumulative increase in gain as the study progressed. Within the first 42 d, an 11.8% increase ($P = .02$) in daily gain and 12.3% increase ($P = .01$) in feed efficiency was noted for ewe lambs implanted with zeranol. Daily gain, feed intake, and efficiency of feed conversion did not differ ($P > .10$) between treatment for the remainder of the study. Zeranol implants did not affect the number of ewe lambs exhibiting estrus (non-implanted = 12 ewes; implanted = 13 ewes) or interval from ram introduction to estrous (non-implanted = 18 d; implanted = 19 d). These data suggest that zeranol implants can be used to increase body weights of ewe lambs, but reproductive activity is not influenced.

Key Words: Growth, Reproduction, Implants

1054 Partitioning lamb and wool production costs. H. D. Blackburn^{*} and W. Pittroff, *USDA-ARS, Dubois, ID*.

Simultaneous production of lamb and wool makes evaluation of these two enterprises as separate activities by sheep producers difficult. A method was developed to overcome this shortcoming by using a bioeconomic sheep simulation model which partitioned the proportion of energy used for wool and lamb production. Resultant coefficients (of energy partitioned to lamb and wool production) can be used in apportionment of expenses and returns to each enterprise as follows: wool (or lamb) profit ratio = wool (or lamb) income/(wool (or lamb) coefficient*total expenses). This calculation method was applied to range sheep production systems in the Great Basin. Four breed types were evaluated [Rambouillet (RB), Merino x Rambouillet (MxR), blackface (BF) and Finn x Rambouillet (FxR)] under varying price scenarios. Sheep nutrition and management practices were similar to those used in the region. The following table provides net returns and profitability ratios for breeds of sheep in the Great Basin system.

Trait	RB	MxR	BF	FxR
Lamb born/ewe	1.34	1.29	1.44	1.61
Net return, \$	24.01	29.98	23.97	30.80
Lamb profit ratio	1.47	1.44	1.58	1.64
Wool profit ratio	1.31	1.89	0.46	1.03

Although the FxR had higher fertility rates its net profit was only slightly higher than MxR. Lamb and wool profitability ratios demonstrate that as an enterprise wool production for the MxR is generating more profit than lamb production. For FxR wool is only marginally profitable while lamb is more profitable. These results indicate how emphasis on lamb and wool production can significantly effect the profitability of the sheep enterprise and provide producers with a tool for evaluating enterprise profitability.

Key Words: Lamb, Wool, Profit

1055 Supplemental feeding interval for sheep. J. E. Huston^{*}, B. S. Engdahl, and K. W. Bales, *Texas Agricultural Experiment Station*.

Two range trials (one fall and one winter; 91 ewes) and a confinement trial (36 ewes) were conducted to determine effects of supplementing adult Rambouillet ewes at 1-, 2- (or 4-), and 7-d intervals. In each range trial, pregnant ewes were assigned to three pasture groups and within each pasture group to four feed treatments. Feed treatments were control (Control; no supplemental feed), cottonseed meal (CSM; 25% of protein requirement), energy equivalent (Low; one-half protein and equal energy with CSM), and protein equivalent (High; equal protein and twice energy with CSM). The three pasture groups were penned either at 1-, 4- or 7-d intervals and individually fed. The pasture groups were rotated among pastures at 3-wk intervals to minimize pasture effects. The range trials lasted 81 and 73 d, respectively, during which parturition occurred. Data collected included initial and final weights. A confinement trial (49 d) was conducted with 36 adult nonpregnant ewes fed oat hay free-choice and .23 kg/hd (as fed) daily equivalents of cottonseed meal (CSM) at 0, 1-, 2-, and 7-d intervals to determine patterns of serum urea nitrogen (SUN). In the range trials, statistical contrasts indicated that all feed treatments reduced ($P < .05$) weight loss compared with Control when feeding was daily. However, there was a feed treatment x interval interaction ($P = .098$) showing that the effectiveness of CSM and Low did not differ ($P = .21$; $P = .58$) with feeding interval; whereas, the High treatment was less ($P = .01$) effective when fed at less frequent intervals. In the confinement trial the SUN levels in ewes fed at 7-d intervals remained higher ($P < .04$) than Control until d 5 and not lower ($P > .17$) than 1-d until d 6 after the feeding event. These data show that sheep, like cattle, can be fed a protein supplement effectively as infrequently as one time per week.

Key Words: Sheep, Supplementation Interval, Serum Urea

1056 The use of an electronic estrous detection system to monitor estrous behavior in Angus females of various ages. K. K. Kuhlmann, D. R. Shelby*, C. B. Scott, B. J. May, and G. R. Engdahl, *Angelo State University, San Angelo, TX.*

The length of estrus and mounting behavior of 23 yearling, 20 lactating two-year-old, and 35 lactating mature Angus females that had received Syncromate-B™ (SMB) treatment were monitored by the Heat Watch™ (HW) electronic estrous detection system. The animals were fitted with transmitters over their sacrum at the time that the SMB ear implants were removed. The HW system was set to record all mounts of 2 sec or longer duration, and calves remained with their dams throughout the study. Females were inseminated at 6, 12, or 18 h after first standing to be mounted. Yearling heifers (1228±128 min) stood to be mounted over a longer period of time ($P<.05$) than two-year-old (397±69 min) or mature (407±57 min) cows. The percentage of females that began mounting behavior during 6-h periods were: 0000 to 0600, 16.7%; 0600 to 1200, 43.0%; 1200 to 1800, 25.0%; and 1800 to 0000, 15.3%. The number of mounts recorded for each age group of females averaged 31±5, 35±10, and 21±4, respectively, for the yearling, two-year-old and mature females. Females which became pregnant at the first AI service following synchronization averaged 40±7 mounts while those that did not become pregnant at the first service averaged 23±5 mounts. The average length of time between the first mount and the time of insemination was longer ($P<.05$) for those females which became pregnant (916±84 min) at the first AI service following synchronization than for those which did not become pregnant (580±83 min). This study indicates that yearling heifers remain in standing estrus more than twice as long as older lactating females and that females should not be inseminated within 12 h following the first standing mount.

Key Words: Cattle, Estrus, Heat Watch

1057 Effects of dam's weight, body condition and udder scores on calf birth weight and preweaning growth rate in beef cattle. M. H. Makarechian* and U. Paputungan, *University of Alberta, Canada.*

Records of weight, age, body condition score and udder score at calving of 425 beef cows and birth weights and periodical pre-weaning weights of their offspring were analyzed by covariance analysis to study the effects of dam's body weight, condition and udder scores on birth weight and preweaning growth of the calf. Cows body conditions were scored from 1 to 5 and cows udders were scored from 1 to 7. The cows were from three distinct synthetic lines and were bred for 45 days on pasture. Within each line and year, the dams were classified into high, medium and low based on their weights at calving. Dam age and calf birth date were used as covariates. Calves born to heavier dams were heavier at birth and had higher rate of growth. The effects of dam's body condition score on calf's birth weight was not significant. However, calves born to cows with condition scores of 2.5 or 3 grew at a faster rate than those born to dams with higher scores. Calves born to cows with large udder teats had higher preweaning growth rates than those born to cows with smaller teats. Based on the results, it can be concluded that cows should be maintained in average body condition during pregnancy, and maintaining cows at higher conditions reduces the efficiency.

Key Words: Preweaning Growth, Cow Condition, Udder Score

1058 Comparison of a molasses-based free-choice supplement to a corn-based daily-fed supplement with gestating cows. D. F. Coombs*¹ and D. W. Sanson², *LSU Ag. Center, ¹Dean Lee Research Station, Alexandria and ²Rosepine Research Station, Rosepine.*

One hundred forty-nine crossbred cows (536 ± 8 kg) were used to compare the effect of a molasses-based, free-choice supplement to either a corn-based supplement or to no supplement. Bermudagrass hay (10% CP) was offered free-choice. The molasses-based supplement (30% CP) was a commercial formulation that contained molasses, plant protein, grain, grain by-products, animal fat, and urea. The corn based supplement was formulated using corn, cottonseed meal, and urea at a similar estimated energy and protein content with a similar level of NPN (13% of supplement CP). The molasses-based supplement was available free-choice. The block was weighed every 7-d to determine weekly intake. Although projected intake of supplement was .91 kg/d, intake of the supplement was only .44 kg/d. Feeding level of the conventional supplement was .91 kg/d, based on the projected intake of the molasses-based supplement. Supplementation started 70 d prior to initiation of the calving season, and continued until the end of the 84 d calving season. As cows calved, they were removed from the supplement and placed on ryegrass. Cows were weighed just prior to the initiation of the supplement, 1 week prior to the start of the calving season, and 2 weeks after the end of the 60 d calving season. Data were analyzed using GLM procedures of SAS, with means separated by a protected lsd. Supplementation did not effect ($P = .42$) cow weight gain prior to calving. There also was no effect of supplementation on weight loss during the calving season ($P = .25$). From the initiation of supplementation to the end of calving season, cows gained ($P = .51$) 20, 26, and 20 ± 9 kg for molasses, corn and no supplement, respectively. In summary, gestating cows receiving no supplement performed similar to those that were supplemented and suggest that forage quality should be evaluated prior to evaluation of supplementation needs.

Key Words: Supplementation, Beef Cows, Molasses

1059 Evaluation of main factors affecting the efficiency of passive injectable transponders as a method of electronic identification in cattle. C. Conill*, G. Caja, R. Nehring, and O. Ribó, *Universitat Autònoma de Barcelona, Bellaterra, Spain.*

A total of 686 PIT (passive injectable transponders, Tiris, Texas Ins., Almelo, NL) of two sizes (23 and 32mm) were subcutaneously injected in three body sites (A, armpit; S, ear-scutulum; and L, upper-lip) in 343 calves (1 to 3 months old). Injections were performed by 2 different teams (T, trained; and U, untrained). Post-injection losses and breakages in the farm were recorded using two hand-held readers (Portoreader, Insentec, NL; and Gesreader I, Gesimpex Com., Barcelona, ES). Dynamic reading efficiency (DRE) was evaluated monthly until slaughter (9 to 12 months old), using a transceiver (S-1000, Gesimpex Com.) working at a field strength of 137 dBµV/m. The total number of PITs that fell or broke in the slaughtering line, the location method within each injection area and the recovery time, were also recorded. Results in the farm showed very low breakages (0.4%, $P> 0.05$) and differences in losses according to body site (L, 14.0%; S, 5.2%; and A, 1.7%; $P< 0.05$). Interactions between body site x PIT size, and body site x training were significant ($P< 0.05$), showing higher losses using 32mm in L and S, and with U in A. Average DRE was higher for 32mm in all body sites (A: 99.9 vs 95.8 %; S: 93.8 vs 81.9 %; L: 66.8 vs 53.4 %; respectively for 32 vs 23mm). The PITs that fell or broke in the abattoir (2.8%) were not affected ($P> 0.05$) by size and body site. Most of the PITs injected in A were recovered by sight (49.2%), in S by cutting (79.9%) and in L by palpation (83.9%) and 10.7% of PIT injected in A were recovered from skin. A significant effect ($P< 0.05$) of body site on recovery time was observed. The quickest mean time was found in L (27s), followed by S (52s) and A (78s). In conclusion, taking into account retention and reading, the injection of 32mm PIT in A showed the better performance in the farm. In addition, injection in the A permitted a carcass traceability of 89.3%. Nevertheless a careful and longer recovery was needed in the abattoir. Improvement of recovery methodology in the abattoir would be necessary in order to recommend the injection of PIT in the armpit instead of ear-scutulum in practice.

Key Words: Electronic Identification, Injectable Transponders, Cattle

1060 Timed artificial insemination using GnRH, PGF2α and estradiol benzoate. C. M. Barros*, P. Fernandes, A. L. G. Gambini, and M. B. P. Moreira, *Universidade Estadual Paulista (UNESP), Brazil.*

In Nelore breed the short estrus associated with high incidence of estrus at night lead to low reproductive efficiency in AI programs. In order to avoid the need for estrus detection, the present work has the purpose of testing timed AI, using hormonal treatments that cause synchronization of ovulation in zebu cattle. The ovary of 360 Nelore cows were examined by ultrasonography to select animals with at least one large follicle (>8mm)and/or one CL. The selected animals (n=328) were separated in 3 groups: control (G-I, n=124), GnRH (G-II, n=100) and estradiol benzoate (EB, G-III, n=104). In the control group cows were treated at random stages of the estrous cycle with GnRH agonist (buserelin, Conceptal, 8μg, i.m.) and 7 days later with PGF2α (25 mg, Lutalyse, i.m.). Approximately 12h after estrus detection the cows were AI. Animals from groups II and III received a second injection of GnRH (G-II, 8 μg) or EB (G-III, 1.0 mg, i.m.), 24 h after PGF. All cows from groups II and III were AI 20–24 and 30–33 h after the last hormonal treatment, respectively. Pregnancy diagnosis was done by ultrasonography 33 days after AI. It was observed that in the day of the first GnRH injection there was 57.6, 60 and 56.7% of animals with visible CL, respectively, for groups I, II, and III. Seven days later on the % of CL was 84, 89 and 85.6, respectively. Therefore, the first GnRH injection induced ovulation and originated a new CL in cows from the 3 groups. The results obtained with semen from Limousin and Nelore bulls were much better than those with Red Angus, indicating a low reproductive capacity in the last bull (see below). Excluding the results from Red Angus bull, it is concluded that both treatments GnRH-PGF-GnRH and GnRH-PGF-EB synchronized ovulation and allowed timed AI, resulting in a pregnancy rate around 45%. In control group conception rate was approximately 42% and pregnancy rate was lower than 25%. Therefore, in the present work the pregnancy rate from timed AI was better than that obtained with estrus detection followed 12 h later by AI(P<0.02). Supported by FAPESP.

Parameters	G-I		G-II		G-III	
N	68	22	34	44	56	53
Bull	3	1	2	1	2	1
Conception(%)	39.5	44.4	12.2			
Pregnancy(%)	25A	18.2A	5.9B	47.7A	25.0B	43.3A

Values followed by different letters differ within groups (P<0.01). Bull 1, 2, 3 = Limousin, Red Angus, Nelore.

Key Words: GnRH, Pregnancy, Estradiol

1061 Effects of undegraded intake protein on reproductive performance of primiparous heifers fed low quality forage. T. A. Strauch*, D. J. Patterson, E. J. Scholljegerdes, M. S. Kerley, and J. E. Williams, *University of Missouri, Columbia.*

Two studies were conducted to determine effects of pre- and postpartum undegraded intake protein supplementation on reproductive parameters in postpartum crossbred heifers (n=20). Bloodmeal was the source of UIP. In experiment 1, heifers were fed one of two supplements which provided either 15% CP and .19 Mcal/kg NEg (BM) or 11.5% CP and .19 Mcal/kg NEg (CONT). Heifers received fescue hay (5.7% CP, .07 Mcal/kg NEg) pre- and postpartum until being moved to fescue pastures. Data were analyzed using a split-plot design. Body condition scores (BCS) were higher (P < .02) at the end of Exp. 1 in BM heifers (5.3 vs 4.6, BM vs CONT). Control heifers lost more weight postpartum as compared to BM heifers (0.23 vs .03 kg/d; P < .01). At the end of Exp. 1 BM heifers had more total follicles (11.6 vs 6.6, BM vs CONT; P < .02). Heifers from Exp. 1 were re-randomized into two treatments for Exp. 2, BM (n=9)and CONT (n=10), and placed on Caucasian bluestem pastures. Body condition scores were higher (P < .01) at the end of Exp. 2 for heifers fed BM in Exp. 1 (5.3 BM vs 4.5 CONT). There were significant PTRT × TRT (BM × CONT) interactions at d 7 (Exp. 2) involving number of total follicles (P < .04) and number of small (5 mm or less) follicles (P < .07). No difference in postpartum interval was detected despite differences in total number of follicles. These experiments suggest that BM supplementation potentiates reduced postpartum weight loss and may affect postpartum reproductive performance based on follicular development of primiparous postpartum beef heifers.

Key Words: Undegraded Intake Protein, Postpartum

1062 Effects of diet and timing of nutritional manipulation on the onset of puberty in beef heifers. H. T. Purvis II*, C. R. Floyd, R. P. Wettemann, M. L. Looper, and K. S. Lusby, *Oklahoma Agricultural Experiment Station, Stillwater.*

One-hundred fifty-seven spring-born Angus x Hereford heifers (68 yr one, 89 yr two) were blocked by weaning weight (215 kg) and randomly assigned to one of the following treatments: supplemented with a 40% CP pellet on tallgrass prairie from November 15 to the beginning of breeding (PAST), 40% CP then full fed concentrate diet (NE_m 2.0, NE_g 1.3 Mcal/kg, 14% CP) for 60 or 30 d prebreeding (DRY60, DRY30), or 40% CP and then self-fed low starch supplement (NE_m 2.0 NE_g 1.2 Mcal/kg, 15% CP) 30 d prebreeding (SELF30). Blood samples were obtained weekly beginning March 15. Puberty was defined as the first of two weekly plasma samples with progesterone greater than 1 ng/ml. Winter gains prior to diet changes prebreeding were similar for all treatments (.26 kg/d). At breeding DRY60 were heavier than DRY30 and SELF30, which were both heavier than PAST. Age (P=.14) and weight (P=.17)at puberty were not influenced by treatments. More (P<.05) DRY60 heifers had luteal activity on April 30. On May 30 more (P<.05) DRY60 and DRY30 heifers had luteal activity compared with SELF30 and PAST. By June 30 there was no difference between treatments for luteal activity. There was no difference in pregnancy rates. The onset of puberty can be hastened by short term feeding of a high-energy diet prior to puberty. However, type of energy source or management scheme may impact the onset of luteal activity independent of BW gain.

Item	PAST	SELF30	DRY30	DRY60	SE
Breeding weight, kg	270 ^a	287 ^a	291 ^a	315 ^b	8.8
Luteal activity by month					
April, %	21 ^b	10 ^b	23 ^b	41 ^a	
May, %	58 ^b	59 ^b	76 ^a	83 ^a	
June, %	95	87	100	91	

^{ab}Means within a row without common superscripts differ (P<.05).

Key Words: Luteal Activity, Puberty

1063 Use of electronic identification to monitor mineral intake in range cattle. C. L. Cockwill*¹, T. A. McAllister¹, M. E. Olson², B. J. Chalmers³, D. Milligan⁴, and C. Huisma⁵, ¹*Agriculture and Agri-Food Canada Research Centre, Lethbridge, AB*, ²*University of Calgary, Calgary, AB*, ^{3,4}*Alberta Agriculture, Food and Rural Development*, ³*Strathmore, AB* and ⁴*Airdrie, AB* and ⁵*GrowSafe Systems Ltd., Airdrie, AB.*

Two multiplex radio frequency (RF) mineral feeder systems (GrowSafe Systems Ltd.) were used to monitor feeder attendance by individual cattle grazing two adjacent pastures (33 cow-calf pairs on 53.8 ha; 36 pairs on 40.5 ha). Cows and calves were identified individually by a passive RF device (Allflex USA, Dallas, TX) located in the ear. A new feeding bout was defined as a return to the mineral feeder after a 5-min absence. In the first experiment, feeder attendance was monitored over 13 d. From d 1 to d 6, the trace mineral mix contained 9.8% NaCl (salt, S). From d 7 to d 13, NaCl was present at 22.5% (high-salt, HS). The percentages of cows and calves attending the feeder over the 13 d were low, but similar between S and HS (26% of calves; 64% of cows and 27% of calves; 65% of cows, respectively). Number of feedings per cow and the total duration of feeding were reduced (P < .001) when HS was provided, as compared to S. However, additional NaCl in the mineral mix did not affect (P > .05) number of feedings per calf or total feeding duration of calves. In a second experiment, high-salt mineral mix was formulated to contain 0 (control, C) or .468% fenbendazole (FB, Hoechst Canada Inc., Regina, SK) and was provided in the mineral feeders for the 36 and 33 cow-calf pairs, respectively. All cows and 97% of the calves provided with FB attended the feeder during the 6-d monitoring period whereas only 80% of the cows and 36% of the calves attended the C feeder. Addition of FB increased the number of feedings per cow (P < .001), but did not affect (P > .05) total duration of feeding as compared to C. For calves, FB increased the total duration of feeding (P < .05) as well as the number of feedings per calf (P < .001). The RF identification system allows mineral feeding behaviour to be monitored more closely than was previously possible. These experiments demonstrated that calves access the mineral to a lesser extent than cows and that uniform consumption of an additive in mineral by all animals in the beef herd is unlikely. Although additives such as FB may increase mineral intake, the possibility that enhanced attendance at the mineral feeder was due to a concentrated session of foraging by the herd in the immediate vicinity of the feeder cannot be discounted.

Key Words: Mineral, Intake, Beef Cattle

1064 Effects of limit-fed high protein creep and Synovex-C implant on subsequent cow productivity of Angus and Brangus heifers. W. E. Wyatt*, D. L. Thompson, and D. C. Blouin, *Louisiana State University Agricultural Center, Jeanerette.*

Angus (A; 99) and Brangus (B; 133) spring-born heifers from the 1991–1993 calf crops had received one of four preweaning calf treatments: implant (I)-creep (C), I-no creep (NC), no implant (NI)-C, and NI-NC. Implants (progesterone-estradiol benzoate; Synovex-C®) were administered in late-April. Cottonseed-meal creep was limit-fed (.45 kg/d) from early-July until weaning in October. Heifers were retained for the 90-day, breeding season beginning in mid-April. Heifers (cows) failing to conceive were culled from the herd. Offspring calf growth performance and cow lactational performance (weigh-suckle-weigh) were monitored for two successive calf crops (first and second parity). Random effects of cow birth year (Y) and Y × parity (P) and the fixed effects of P, cow breed, implant status, and creep status were included in the statistical model. Second-P calves were heavier (P<.10) at birth (35 vs 33 kg) and at weaning (222 vs 196 kg), having greater (P<.05) preweaning ADG (.83 vs .71 kg) than first-P calves. Brangus calves were born later (P<.01) in the year than A calves. Implant-C cows calved later (P<.05) in the calving season than I-NC, NI-C, and NI-NC cows. Angus calves whose dams were implanted had lower birth weights (P<.05; 32.5 kg), preweaning daily gains (P<.05; .71 kg), and weaning weights (P<.07; 198 kg) than remaining A calves (34.1, .76, and 211 kg) and B calves whose dams were fed (34.7, .82, and 214 kg) or not fed creep (33.6, .79, and 213 kg). Milk yield was regressed on calf age in weeks to describe lactational performance. Intercept values were similar (4.93 vs 4.53 kg; P=.12), but linear (–.18 vs –.07 kg) and quadratic (.002 vs –.001 kg) coefficients differed (P<.01) between A and B cows. Preweaning management treatments had no effect on the subsequent calf performance of B cows. However, A cows that had been limit-fed a high-protein creep as calves, reared lighter calves, despite the lack of creep effects on their own pre- and postweaning growth traits.

Key Words: Beef cattle, Creep-feeding, Synovex

1065 Effects of bull exposure and nutritional supplementation on postpartum anestrus interval in suckled Zebu cows. O. P. Akinpelumi*, E. O. Oyedipe, L. O. Eduvie, and H. Makun, *NAPRI/ABU Nigera.*

Extended postpartum anestrus periods are prominent features of reproductive inefficiency in tropical Zebu cows. Undernutrition and isolation from bulls are two factors that have been implicated in prolonged postpartum intervals in lactating cows. The objective of this study was to determine the effectiveness of nutritional supplementation and bull exposure in shortening the postpartum period to estrus in suckled Zebu cows. In a 2 × 2 factorial arrangement, multiparous cows were assigned at calving to be either grazed only and exposed to bulls (NSBE, n=12) or isolated (NSNE; n=13); or in addition to grazing, to receive 600g h-1 d-1 of a 20.8% CP supplement and exposed to bulls (SSBE, n=14) or isolated (SSNE, n=12). Estrus was monitored over 180 days by visual observation and weekly milk progesterone concentrations. Data were analysed by X2 and ANOVA. A greater proportion of SSBE cows manifested estrus within 120 days postpartum in comparison to other treatments. Exposure to bulls and supplementation concurrently reduced postpartum anestrus intervals in Zebu cows.

Cows(%)showing estrus by days postpartum						
Treatment	n	≤90	91–120	121–150	151–180	Postpartum Interval (days)
SSBE	14	50.0 ^a	21.4 ^b	28.6 ^b	–	95.4 ^a (29.4) ¹
SSNE	12	25.0 ^b	8.3 ^c	58.4 ^a	8.3 ^b	119.0 ^b (30.4)
NSBE	12	8.4 ^c	33.3 ^a	33.3 ^b	25.0 ^a	128.2 ^c (32.3)
NSNE	13	15.4 ^{bc}	7.7 ^c	46.1 ^a	30.8 ^a	134.1 ^c (29.4)

^{abc} - Within the same column, different superscripts indicate significant differences (P ≤ 0.01).

¹ Standard deviations of values are in parenthesis

Key Words: Postpartum Interval, Supplementation, Bull Exposure

1066 Effects of varying levels of undegradable intake protein (UIP) on endocrine and metabolic function of postpartum (PP) beef cows. K. K. Kane*, K. W. Creighton, A. M. Encinas, D. E. Hawkins, M. K. Petersen, D. M. Hallford, and T. T. Ross, *New Mexico State University, Las Cruces.*

Twelve Hereford × Angus heifers, 2.5 yr, 480±60 kg (body condition=5), were randomly assigned to one of three supplements (S) according to calving date and calf sex. Treatments consisted of: 1) low UIP (L: 908 g·cow⁻¹·d⁻¹; 36% CP; 108 g UIP), 2) mid UIP (M: 908 g·cow⁻¹·d⁻¹; 36% CP; 165 g UIP), and 3) high UIP (H: 908 g M + 243 g feathermeal·cow⁻¹·d⁻¹; 47% CP; 335 g UIP). Cows were fed sudan grass hay (CP 7.3%) at 2% BW. Supplement was individually fed twice weekly, wk 2–11 PP. Every 2 wk, cow and calf BW were measured while backfat (BF) and rumpfat (RF) were determined via ultrasonography. On wk 6, 8, and 10 PP, blood urea nitrogen (BUN) was evaluated from samples collected 0, 3, 6, and 12 hr post S. Milk components and yield were measured on wk 5, 6, 8, and 9 PP. On d 42 PP, a GnRH challenge was conducted (360 min duration, 15-min intervals). Following GnRH administration (5 µg; iv) at 60 min, collection continued for an additional 300 min. Uterine pH was measured wk 11 PP on two S and two nonsupplement (NS) days. All cows lost BW during the study (P<.01), with no difference in cow BW loss or calf BW gain among treatments (P>.10). Backfat and RF decreased among cows during the study (P<.05) yet changes in BF and RF did not differ among treatments (P>.10). No differences in BUN among treatments were observed (P>.10). Milk components and yield did not differ among treatments (P>.10). Luteinizing hormone area under the curve was greater (P=.10) in H (809±69 units) vs L and M (599 and 607±69 units, respectively). Uterine pH did not differ among treatments (L, 7.05; M, 7.00; H, 7.03±.05; P>.10) or between S vs NS days (7.03 and 7.02±.03, respectively; P>.10). Under the conditions of this study, BW, BUN, milk components and yield, and uterine pH were not affected by level of UIP. However, high UIP enhanced pituitary response to GnRH.

Key Words: Undegradable Intake Protein, Postpartum Cows, LH

1067 Thyroid hormone profiles in gestating brahman and angus cows. T. A. Thrift*, A. Bernal, A. W. Lewis, D. A. Neuendorff, and R. D. Randel, *Texas A&M University Research and Extension Center, Overton.*

Multiparous gestating Brahman (n=9, BW=570kg, BCS=7.2) and Angus (n=9, BW=493kg, BCS=5.4) cows were utilized to characterize thyroid hormone profiles. All cows were between 49 and 82 d of gestation at the onset of the study. Monthly blood samples were obtained from July through January for analysis of triiodothyronine (T3) and thyroxine (T4) to characterize seasonal changes in hormone concentration. On sampling days, blood was obtained via tail venipuncture starting at four hr intervals from 8:00am for a 24 hr period to characterize diurnal changes in thyroid concentrations. Overall analysis revealed significant (P=.0001) interactions of day × breed and hr × breed. Brahman cows had higher (P<.05) concentrations of T3 and T4 in July, August, November, December, and January and were either similar (P>.05) or lower (P=.002) in September and October. Analysis of the 24 hr profile revealed that Brahman cows had higher (P<.05) T3 concentrations at all sampling times whereas T4 was higher (P<.05) at all times except for the 20 and 24 hr sample times. Daily high ambient temperatures in July (36.3°C) and August (35.7°C) corresponded to suppressed T3 and T4 concentrations in Angus cows suggesting heat stress. Daily low ambient temperatures in November (12.8°C) and December (6.7°C) corresponded to elevated T3 and T4 concentrations in Brahman cows. The elevation in thyroid hormone concentrations observed in Brahman cows also corresponds to the period of seasonal anestrus that has been documented in *Bos indicus* females.

Key Words: Thyroid Hormones, Brahman Cows, Reproduction

1068 Effect of a seven day stair-step feeding regiment versus ad libitum feeding throughout lactation on sow and litter performance. B. A. Belstra*, B. T. Richert, J. W. Frank, and D. C. Kendall, *Purdue University, West Lafayette, IN.*

Fifty lactating sows, of two genotypes (1/2 Landrace, 1/4 Large White, 1/4 Duroc, n=17 and 1/2 Yorkshire, 1/2 Landrace, n=33) were utilized to access the impact of two feeding regiments on sow feed intake, weight change, backfat change and litter weight gain. Sows were fed twice daily beginning on d 1 of lactation and were either allowed ad libitum access to feed (AL, n= 25) or were fed in a stair-step regiment (SS, n=25) from d 1 to d 7 of lactation (d 1, 0.9 kg; d 2, 1.8 kg; d 3, 2.7 kg; d 4, 3.6 kg; d 5, 4.5 kg; d 6, 5.4 kg; d 7, 6.3 kg) followed by ad libitum feeding for the remainder of lactation. Average intial litter size was 10.3 pigs and average lactation length was 24 d. Both treatments were fed a corn-soybean meal based lactation diet (16% CP; .8% lysine). Sow feed intake was measured daily and sow BW, 10th rib backfat (BF) and litter weight (LW) were measured on d 2, d 7, d 21 and at weaning. Week 1 ADFI for SS versus AL sows was different (3.4 ± .2 kg vs 5.3 ± .2 kg; P<.001), but ADFI was similar for week 2 (5.9 ± .5 kg vs 6.6 ± .4 kg; P>.25) and week 3 (6.4 ± .4 kg vs 6.4 ± .5 kg), respectively. Sow BW change at d 7 (.12 ± 1.9 vs -.44 ± 1.9 kg; P>.8) and overall (-6.9 ± 2.3 vs -10.8 ± 2.4 kg; P>.24) was not different between the SS and AL sows, respectively. Sow BF change at d 7 (-2.0 ± .5 vs -1.0 ± .5 mm; P<.18) and overall (-3.9 ± .7 vs -3.6 ± .7 mm; P>.7) was not different between the SS and AL sows, respectively. LW at d 7 (24.9 ± 0.8 vs 27.8 ± 0.8 kg; P<.02) was greater for the AL sows, however, overall (59.7 ± 2.9 vs 65.6 ± 2.9 kg; P<.16) LW at weaning was not different between SS and AL sows, respectively. LW gains were different for SS and AL fed sows from d 2 to d 7 (7.8 ± 4 .7 vs 9.5 ± .7 kg; P<.09), however, overall LW gain was not different between feeding regimens (44.1 ± 2.5 vs 47.4 ± 2.4 kg; P>.3). These data suggest, a restriction of sow feed intake during early lactation reduces LW gain but has little effect on sow body condition and subsequent feed intake.

Key Words: Sow, Lactation, Feed Intake

1069 Dietary supplementation of proteinated trace minerals influences reproductive and growth performance of replacement gilts. C. E. Hostetler and M. A. Mirando, *Washington State University, Pullman.*

This study determined if dietary supplementation of proteinated essential trace minerals (ETM) Cu, Mn, and Zn influenced growth or reproductive performance replacement gilts. Fifty prepubertal crossbred gilts were randomly and equally allotted in four replicates to two dietary treatments at 105 d of age. Gilts had free-choice access to diets containing 14.0–14.5% crude protein (0.67% lysine), 3176 kcal/kg digestible energy and: (1) Cu, Mn and Zn provided as inorganic salts (control diet) or (2) 25% of the inorganic ETM salts replaced with the proteinated form (OPTiMINS®, DuCoa, Highland, IL). Beginning at 136 d of age, gilts were limit fed 1.8 kg/d of the diets containing 38 ppm Cu, 96 ppm Mn, and 192 ppm Zn (supplemented as described above for control and proteinated diets), exposed to a mature boar for 20 min daily, and mated daily during second estrus. One-half of the gilts in each treatment × replicate group were randomly chosen to be hysterectomized on d 12 or 15 of pregnancy, at which time corpora lutea were counted to determine ovulation rate. Each uterine horn was flushed to confirm pregnancy and collect conceptuses. Rate of gain was influenced by treatment diet (P<0.01), replicate (P<0.001) and treatment diet × replicate (P<0.05). This indicated the 12% average increase in rate of gain for gilts on the proteinated diet was more pronounced in one replicate than the others. Average daily feed intake and feed to gain ratio were not significantly affected by diet. Gilts receiving the proteinated diet attained puberty 13 d earlier (P<0.01) than control gilts. Pregnancy and ovulation rates were similar for gilts on the proteinated and control diets. On d 12, total conceptus wet weight was similar for the two treatment groups, but tended to be greater (P=0.10) for gilts receiving the proteinated diet on d 15. These results indicate that proteinated Cu, Mn, and Zn, provided to replacement gilts as a portion of the supplemented ETM, may enhance growth rate, reduce age at puberty, and advance embryonic development.

Key Words: Minerals, Reproduction, Swine

1070 Effects of environment, genotype, and health management system on pig growth performance. J. W. Frank¹*, B. T. Richert¹, A. P. Schinckel¹, B. A. Belstra¹, S. F. Amass¹, and L. Watkins², ¹*Purdue University, West Lafayette, IN,* ²*Elanco Animal Health, A Division of Eli Lilly & Co., Greenfield, IN.*

Two hundred ninety-six pigs were used to evaluate the effects of production system, genetic potential for lean gain, and health management scheme interactions on pig growth performance. Littermate barrows and gilts were either segregated-early-weaned at 12d of age (TS-EW; BW = 3.95 kg) to an off site nursery and grower-finisher or conventionally weaned at 28d of age (CF; BW = 7.36 kg) to an on-site nursery and finisher. Three terminal sire lines (L, M, H) increasing in genetic potential for lean gain were bred to European Large White × Duroc sows. Pigs were fed a diet which included 55.1 mg/kg Carbadox in the nursery followed by 7 days of 441 mg/kg chlorotetracycline. Treatments were no vaccination with non-medicated diets (CON) or *Mycoplasma hyopneumonia* vaccination followed by two veterinary feed directives of 300 mg/kg tilimicosin (VT) in the diet from 50–70d and 71–91d of age. All pigs received 44.1 mg/kg Tylosin after treatment to slaughter. CF pigs had greater ADG in the finisher (P<.001) and greater ADG/ADFI (P<.001) than TS-EW pigs. VT pigs had greater ADG during treatment in the nursery (50–56d; P<.01), finisher (57–91d; P<.01), and from 92–133d (P<.001) than CON. VT pigs also had greater ADFI during treatment in the finisher (57–91d; P<.001) and from 92–133d (P<.01). In the CF environment, L pigs had the greatest ADG, while in the TS-EW there were no differences among genotypes (P<.001). CON pigs had a higher deathloss than VT pigs (P<.05) in both production systems. The combination of tilimicosin and vaccination appear to be a valuable tool to improve growth performance of pigs.

Environment	CF		TS-EW		SE
Treatment	CON	VT	CON	VT	
ADG, g					
50–56d	492	559	483	535	16.5
57–91d	761	829	807	871	27.8
92–133d	864	939	786	809	17.5
ADFI, g					
50–56d	974	1007	980	979	19.2
57–91d	1434	1556	1652	1748	25.8
92–133d	2431	2687	2231	2318	50.1
Deathloss, %	2.21	0.00	2.47	0.00	1.06

Key Words: Environment, Antibiotic, Pigs

1071 Competitive exclusion of *Salmonella* from the pig gut. R. C. Anderson^{*1}, D. J. Nisbet², S. A. Buckley², R. B. Harvey², K. J. Genovese², N. K. Keith³, and L. H. Stanker², ¹*Milk Specialties BioScience, Dundee, IL,* ²*USDA/ARS, FAPRL, College Station, TX* and ³*Keith Associates, Springfield, MO.*

Competitive exclusion (CE), the exclusion of pathogens by healthy microbes, is sought as a mitigation strategy to preclude colonization of the pig gut by *Salmonella* sp., bacteria costing the U. S. swine industry >\$100 million annually. Drawing upon expertise gained during development of a defined CE culture now being used successfully by the poultry industry, we have developed and tested two porcine-derived CE cultures. Culture pCF1 was propagated from cecal contents of a healthy pig; pCF3 was derived via dilution of pCF1. Both were maintained in steady state via continuous-flow culture. In 3 separate experiments, 5 ml of pCF1 or pCF3 (equivalent to 10⁸ cfu) were given orally at birth and at weaning (14 d of age) to piglets from 3 and 2 litters, respectively. Three other litters served as controls. One day post weaning, the piglets were challenged orally with 10⁷ to 10⁸ cfu *S.choleraesuis*. Rectal swabs collected daily and samples collected upon necropsy 1 wk post challenge were cultured for salmonellae. Combined results from the experiments are presented below. Shedding and gut colonization of the pathogen were reduced within litters treated with pCF1 or pCF3 thus providing evidence that CE treatment may help curb the spread of the host-adapted pathogen, which is spread primarily from pig to pig.

Effect of pCF1 or pCF3 on shedding and colonization of pigs by *S.choleraesuis*.

Treatment	Number of pigs shedding ^a	Incidence of shedding ^b	Colonization ^a	Cecal conc'n ^b
			Tonsil	log ₁₀ <i>Salmonella</i> /g
Control	30/32	51%	19/23	3.0
pCF1	16/26*	18%*	13/26*	1.9*
pCF3	10/16*	15%*	8/16*	2.4

^a Chi-square.
^b ANOVA.
^c ILym, ileocolic lymph nodes.
 Values differ from control (P<0.03).

Key Words: *Salmonella*, Competitive Exclusion, Swine

1072 Amino acid, fat and enzyme supplementation equalize the performance of corn and barley diets for swine. T. G. Hartsock^{1*} and M. J. Estienne², ¹*University of Maryland, College Park* and ²*University of Maryland Eastern Shore, Princess Anne.*

Performance was assessed on 96 Landrace × Large White F1 maternal line barrows (Peninsula Pork Inc., Eden, MD) fed in 3 phases from 29 kg to 104 kg live weight with diets based on corn (C), corn-barley (CB) mixture (equal amounts, by weight), barley (B), and barley plus PorzymeTM 9100 (Finnfeeds International Ltd., Schaumburg, IL) (BE). Diets were supplemented with soybean meal, fat (white grease) and amino acids such that C, CB, and B diets were isocaloric within phases and maintained lysine to ME ratios (g/Mcal) of 3.2, 2.9 and 2.6 in phases 1, 2 and 3, respectively. PorzymeTM 9100 is a blend of enzymes that improves the utilization of barley's nutrients by swine and the composition of the BE diet was formulated (using less soybean meal and fat and more barley than the B diet) such that the enzymes' predicted effects would make it nutritionally equal to the other diets. All diets were fortified with vitamins and minerals to meet or exceed NRC (1988) minimums. Backfat thickness (BF) and loin eye area (LEA) at the tenth rib were measured with real time ultrasound and adjusted to a weight constant of 104.5 kg. There were no treatment differences or treatment by phase interactions ($P > .05$), indicating that energy (fat) and amino acid additions can result in corn and barley-based diets performing equally. The data also demonstrated that added enzymes can improve the performance of barley-based diets. Means ($\pm$ SE) of performance data for the entire growout period for C, CB, B and BE diets, respectively, are as follows: ADG (g) 890 ± 27 , 899 ± 27 , 867 ± 27 , 867 ± 27 ; ADFI (kg) $2.89 \pm .08$, $2.88 \pm .08$, $2.79 \pm .08$, $2.84 \pm .08$; F/G $3.27 \pm .07$, $3.22 \pm .07$, $3.22 \pm .07$, $3.32 \pm .07$; BF (mm) 28.4 ± 1.5 , $26.9 \pm .8$, 25.4 ± 1.5 , $25.4 \pm .8$; LEA (cm^2) $34.8 \pm .8$, $34.9 \pm .2$, $34.8 \pm .8$, $34.9 \pm .2$. As expected, average daily feed intake and feed conversion efficiency values increased with age ($P < .01$) but the magnitudes of the changes were not as expected. In addition, average daily gain peaked in phase 2 (55–80 kg) and was lower ($P < .01$) in phases 1 (29–55 kg) and 3 (80–104 kg). Performance data for phases 1, 2 and 3, respectively, follow: ADG (g) 831 ± 18 , 994 ± 18 , 817 ± 18 ; ADFI (kg) $2.03 \pm .05$, $3.12 \pm .05$, $3.40 \pm .05$; F/G $2.46 \pm .07$, $3.15 \pm .07$, $4.17 \pm .07$. These data demonstrate that the rapid genetic changes in the swine industry preclude using standard or traditional growth/lean gain models to design feeding programs.

Key Words: Swine, Barley, Finishing

1073 Effects of calf age and nutritional regime on feedlot performance and carcass characteristics. J. A. Thielen*, D. L. Hixon, B. W. Hess, and M. L. Riley, *University of Wyoming, Laramie.*

The objectives of this study were to determine the effects of calf age and nutritional regime on feedlot performance, carcass characteristics and tenderness of product at similar external fat endpoints. Steer calves ($n = 112$) produced from an Angus/Gelbvieh rotational crossbreeding program were assigned to either an early wean (EW; average age = 170 d) or late wean (LW; average age = 250 d) group. After a 30 d adjustment period following weaning, steers were blocked by sire breed and post-adjustment period weight and randomly assigned to either a finishing diet (F; NEg = 1.38 Mcal/kg) or a grow diet (G; NEg = .87 Mcal/kg) for approximately 84 d before being similarly stepped up onto the aforementioned finishing diet. Steers were slaughtered at approximately .1 cm external fat. Analysis of variance was performed on performance and carcass characteristics. Early wean (337 kg) calves were heavier ($P < .05$) than LW (293.5 kg) calves at time of late weaning. Final live weights and hot carcass weights were lighter ($P < .05$) for the EWF (547 and 338 kg) compared to LWG (606 and 375 kg) while EWG (577 and 355 kg) and LWF (569 and 351 kg) were intermediate. Age at slaughter was 413, 465, 467 and 505 d for EWF, EWG, LWF and LWG, respectively. Both early weaning and time on finishing diet enhanced feedlot gains and feed efficiency during the finishing phase. Backfat thickness, ribeye area, marbling scores, quality and yield grades were not different ($P > .05$) among treatments. Warner-Bratzler shear values were lower ($P < .05$) for LWG rib steaks (2.78 kg) as compared to EWF (3.22 kg), EWG (3.23 kg) and LWF (3.07 kg). These data suggest that calves weaned at 170 d perform efficiently in the feedlot and produce carcass characteristics appropriate to satisfy consumer demand.

Key Words: Early Weaning, Feedlot Performance, Carcass Characteristics/Tenderness

1074 Effects of calf-hood management on carcass merit and performance at feedlot. A. G. Schaneman* and R. H. Pritchard, *South Dakota State University, Brookings.*

The project objective was to evaluate effects of calf management on production, carcass, and economic ranking of feeder calves. Performance data were collected on calves consigned to a commercial feedlot. Least squares analysis included dependent variables of initial weight (INWT), days on feed (DOF), ADG, feed cost of gain (FCOG), hot carcass weight (HCW), marbling (MAR), and calf value (VAL; Gross – Expenses). Independent variables were ranch history of creep feeding, preweaning vaccinations, preconditioning, days of age at weaning (<170 d or >169 d), calf-hood implants (0 = none, 1 = age <120 d, 2 = age >119 d, or 3 = reimplanted), and feedlot morbidity (not treated vs treated). Creep feeding caused a higher ($P < .05$) INWT (250 vs 258 kg), HCW (324 vs 328 kg) and lower MAR (4.86 vs 4.73). Creep feeding did not affect FCOG, DOF, ADG, or VAL. Preweaning vaccinations resulted in a higher ($P < .05$) INWT (245 vs 255 kg), HCW (320 vs 327 kg), ADG (1.28 vs 1.32), and VAL and lower ($P < .01$) DOF (204 vs 198 d) and MAR (4.92 vs 4.81). Preweaning vaccinations did not affect FCOG. Preconditioning was associated with higher ($P < .01$) INWT (251 vs 256 kg), ADG (1.31 vs 1.34), and MAR (4.79 vs 4.90) and reduced DOF (200 vs 194 d) and FCOG (98.31 vs 96.25 \$/kg gain). Preconditioning did not affect HCW or VAL. Days of age at weaning increased ($P < .01$) INWT (246 vs 256 kg), MAR (4.74 vs 4.86), and FCOG (98.31 vs 96.25 \$/kg gain) and reduced DOF (201 vs 197 d). Days of age at weaning did not affect HCW, ADG, or VAL. Calves treated at the feedlot had a higher ($P < .01$) INWT (252 vs 259 kg), HCW (324 vs 335 kg), and ADG (1.31 vs 1.35) but did not affect DOF, REA, MAR, FCOG, or VAL. INWT, HCW, DOF, and FCOG were affected by IMPLT (0 vs 1, 2, and 3; $P < .05$), but IMPLT (0 vs 1, 2, and 3) did not affect ADG, MAR, or VAL. INWT, HCW, MAR, FCOG, and VAL were affected by IMPLT (1 vs 2; $P < .01$). ADG, DOF, and FCOG were affected by comparisons of IMPLT (1 and 2 vs 3; $P < .01$).

Key Words: Calf Value, Management, Feedlot

1075 Carcass characteristics of Native and Mexican steers in relation to dentition. N. C. Tipton^{1*}, J. C. Paschal², M. J. De La Zerda¹, D. B. Griffin¹, D. S. Hale¹, and R. T. Bretz³, ¹*Texas A&M University, College Station*, ²*Texas Agricultural Extension Service, Corpus Christi*, ³*King Ranch Inc., Kingsville.*

Dentition is a method utilized, particularly in Australia, for determination of cattle physiological age by evaluation of eruption of permanent incisors. The main objective of this study was to determine the effect of Dentition Group (DGRP), Place of Origin (OGRP) as well as Slaughter Date (SDAT) on USDA carcass quality and yield grade characteristics, particularly USDA lean maturity (LMAT), USDA skeletal maturity (SMAT), overall USDA maturity (OMAT) and the resulting USDA quality grade (QGRD). Steers ($n=175$) were classified into two OGRP of Mexican (MEX) origin ($N=74$) (primarily of Zebu × dairy influence), as well as Native (NAT) origin ($N=101$) (primarily of American breed influence). Steers were slaughtered on two different slaughter days and stratified into DGRP based on slaughter floor evaluation of the eruption of permanent incisors by a trained evaluator. The evaluator placed the steers into six DGRP ranging in age from less than 18 months of age to over 34 months of age. DGRP was not significant ($P > .05$) for any measured carcass quality or yield grade characteristic. OGRP was significant ($P < .05$) for carcass weight (CAR), 12th rib fat thickness (FAT), adjusted preliminary yield grade (PYG), USDA yield grade (YLG), SMAT and OMAT. NAT steers had higher CAR, more FAT, higher PYG, more advanced SMAT and resulting OMAT than MEX steers. Slaughter Date was only significant ($P < .05$) for CAR with steers in the second SGRP having heavier carcasses. This study indicates that slaughter floor segregation of carcasses into age groups based on dentition, as measured by the eruption of permanent incisors, is not related to USDA quality grade, particularly skeletal and overall maturity, or USDA yield grade characteristics. Therefore, this study indicates that comparison of carcasses stratified by USDA maturity groups may not be comparable to those stratified by dentition.

Key Words: Dentition, Carcass Characteristics, Carcass Quality

1076 Visual predictors of beef carcass skeletal and lean maturities. J. C. Paschal¹, M. J. De La Zerda^{2*}, N. C. Tipton², D. B. Griffin², and D. S. Hale², ¹*Texas Agricultural Extension Service, Corpus Christi*, ²*Texas A&M University, College Station*.

Identification of live animal characteristics which could aid in prediction of carcass quality could possibly facilitate fed cattle selection for marketing in the feedyard. The purpose of this study was to determine if dentition pattern (DENT), visual evaluation of age (EVAGE), horn circumference (HORNCIR), and horn width (HORNWD) were correlated to carcass quality characteristics. Steers averaging 516 kg live weight and consisting of either Mexican origin (predominately Zebu x dairy influence) or Native origin (predominately American breed crosses) were visually appraised by five experienced personnel for age and assigned to one of seven categorical age groups which ranged from less than 18 months to greater than 4 years of age. Cattle were harvested and carcass data collected by trained personnel. Age determination by dental eruption of permanent incisors was collected on the slaughter floor for each carcass and assigned to one of 6 age categories ranging from less than 18 months to greater than 34 months of age by a trained evaluator. Horn circumference and width between the base of the horns were also measured. DENT, EVAGE, HORNCIR, and HORNWD were not correlated to skeletal maturity (SMAT), lean maturity (LMAT), average maturity (AMAT), marbling score (MARB), and quality grade (QUAL) ($P > .05$). However, average maturity approached significance with a correlation of .08 ($P = .09$). Regression analysis revealed that no characteristic was related to dentition ($P > .05$), although AMAT approached significance ($P = .09$), with an r^2 value of .08. The results of this study indicate that dentition, visual evaluation of age, horn circumference, and width between the horn bases are not good predictors of carcass quality, especially skeletal maturity, lean maturity, overall maturity, marbling score, and quality grade.

Key Words: Dentition, Visual Appraisal, Carcass Quality

1077 Effects of implants on performance of steers during limit-feeding and the subsequent finishing period. F. T. McCollum III^{*1}, G. C. Duff², M. L. Galyean³, and D. K. Lunt¹, ¹*The Texas A and M University System*, ²*New Mexico State University, Las Cruces*, ³*Texas Tech University, Lubbock*.

A trial was conducted to evaluate estrogenic, androgenic, or combination implants for limit-fed steers and subsequent finishing performance. Four implant treatments (Control - no implant, Finaplix S, Synovex S, and Revalor S) were compared in beef steers limit-fed an 85% concentrate ration for 85 d. Target weight gain was 1.02 kg/d. Sixty steers (253 kg) were individually-fed using Calan Gates (15 steers/treatment) and another 64 steers (239 kg) were group-fed in four pens (four steers/treatment/pen). Breed groups and BW were distributed evenly across treatments. After limit-feeding, all steers were combined and allotted to three weight blocks for the finishing period resulting in three pens for each previous implant treatment. All steers were implanted with Ralgro on d 0 and Revalor S on d 56 of the finishing period and fed a 90% concentrate diet. The heavy weight block was fed for 112 d and the other blocks for 126 d. Carcass data were collected at a commercial packing plant. During limit-feeding, gains for the Control, Finaplix, Revalor, and Synovex treatments, respectively, were .97, 1.07, 1.12, 1.11 kg/d (pooled SE=.08, n=15) for the individually-fed steers, and .95, .96, 1.21, 1.02 kg/d (pooled SE=.10, n=16) for the group-fed steers. Entering the finishing period, implanted steers were heavier ($P < .05$) than the Controls (327 kg), and steers implanted with Revalor (345 kg) were heavier ($P < .05$) than steers in the other two implant groups (333 kg). During finishing, Control steers tended to consume less feed ($P < .07$; 9.4 kg DM/d) than steers implanted previously (9.9 kg DM/d). Daily gains ($P > .10$; 1.77 kg avg) and feed:gain ($P > .10$; 5.54 avg) did not differ among treatments. Carcass weights tended ($P < .07$) to be lighter for Control than implanted steers (328 vs. 337 kg avg). Marbling scores did not differ; steers previously implanted with Finaplix tended ($P < .07$) to have lower calculated Yield Grades (2.55 vs. 2.82 avg). Implants increased gain during the limit-feeding period, especially the combination implant. Finishing performance and carcass traits were not influenced by the implants during the limit-feeding phase.

Key Words: Beef Cattle, Implants, Limit-feeding

1078 Influence of clostridial vaccines and injection site on performance and feed consumption behavior of beef steers. N. K. Chirase^{*}, L. W. Greene, G. Graham, and J. Avampato, *Texas Agricultural Experiment Station, Amarillo*.

Several clostridial vaccines are currently being used in the beef cattle industry. Of most concern are the effects of vaccine and injection site on the seroconversion, performance and feed consumption behavior of beef steers. Two experiments (1993 and 1995) were conducted to determine the effect of clostridial vaccines and injection site on the performance and feed consumption behavior of beef steers. In Exp 1, eighty (80) crossbred beef steers (avg wt 237 kg) were randomly allotted into five groups of sixteen steers. Each group was randomly assigned a pen equipped with an individual feed intake monitoring device (pinpointer[®]). Steers were given 14 d to adapt to the feed and pinpointers before starting the study. Each group was randomly assigned to one of the following vaccination treatments: 1) Control (sterile saline water), 2) Alpha-7 Ear (A7E), 3) Alpha-7[®] Prescapula (A7P), 4) Vision-7[®] Prescapula (V7P) and 5) Ultrabac-7[®] Prescapula (U7P). All vaccines were injected subcutaneously and injection sites palpated on d 0 and 28. All treatment groups had similar ($P > .05$) final (d 28) weights. All steers averaged 8.7 kg of daily feed intake except steers vaccinated with A7E and U7P had significantly lower ($P < .05$) feed intake (7.4 kg/d⁻¹). The control steers had total weight gains and ADG similar ($P > .05$) to steers vaccinated with A7E and A7P. In Exp 2, the treatments included control, A7P, Alpha-CD[®] Ear (ACDE), Alpha-CD[®] Prescapula (ACDP), Fortress-7[®] Prescapula (F7P) and V7P. Also, days on feed was extended to 119 d. Results of this study indicated similar ($P > .05$) total weight gains, ADG and feed efficiency for all treatment groups. However, lesion size differed ($P < .05$) by vaccine and time of palpation. These data suggest that vaccinating beef steers subcutaneously at the base of the ear did not reduce performance.

Key Words: Steers, Clostridial Vaccines, Injection Site

1079 Implant Strategies Using Synovex^{®TM}, Synovex[®] S, Synovex[®] C, and Ralgro[®] on Performance and Carcass Characteristics in Finishing Steers. C. T. Milton^{1*} and F. L. Prouty², ¹*University of Nebraska, Lincoln* and ²*Fort Dodge Animal Health, Overland Park, KS*.

One hundred eighty medium-framed, crossbred steers (327 ± .4 kg BW) were allotted to five weight blocks and stratified to one of four implant programs in a 145-d finishing experiment to evaluate single or reimplant strategies on production and carcass traits. Implant strategies were Synovex[®] S d 1 and 70 (S-S), Synovex[®] C d 1 and Synovex^{®TM} d 70 (C-SP), Ralgro[®] d 1 and Synovex^{®TM} d 70 (R-SP), or Synovex^{®TM} d 1 only (SP). Under the direction of FDA, steers assigned to R-SP were not implanted with Synovex^{®TM} on d 70, thus these steers were implanted with Ralgro[®] d 1 only. There was a 17-d, four diet adaptation to a finishing diet (13.5% CP, 6.8% DIP, .7% Ca, .4% P, .7% K) consisting of 63% dry-rolled corn, 22.5% wet corn gluten feed, 7.5% alfalfa hay, 3% tallow, and 4% supplement (DM basis). Treatment means were separated using t-tests with a protected F-test. During the first 70 d, implanting with SP increased ADG 14% ($P < .05$; 2.52 vs 2.17 kg/d) and gain efficiency (G/F) 12% ($P < .01$; .219 vs .194) compared with estrogenic implants. Daily gain of steers implanted with S-S was higher ($P < .01$) than those implanted with Ralgro[®], but was similar to C-SP. Over the 145-d finishing period, steers implanted with Ralgro[®] had lower ($P < .01$) DMI, ADG and G/F than other implant strategies. Implanting with SP increased ($P < .05$) DMI compared with C-SP, but DMI was similar to S-S. Compared with S-S, implant strategies using SP or C-SP increased ADG 4.7% ($P < .01$; 1.85 vs 1.94) and G/F 4.3% ($P < .05$; .158 vs .165). Using the implant strategy C-SP improved G/F 3.5% ($P < .05$; .162 vs .168) compared with SP. Carcass weights were 11 kg heavier ($P < .01$) for SP and C-SP than S-S implanted steers. Fat thickness, yield grade, marbling, and Choice carcasses were unaffected by implant strategy. Implanting steers with a low-dose estrogen followed by a combination of trenbolone acetate and estradiol enhanced performance without negatively influencing carcass characteristics.

Key Words: Implants, Feedlot, Beef

1080 Active immunization of bulls against GnRH: Effects on testes, feedlot performance and carcass characteristics. B. Cook¹, J. Popp², J. Kastelic¹, S. Robbins³, and R. Harland³, ¹Agriculture and Agri-Food Canada, Lethbridge, AB; ²Alberta Agriculture, Food and Rural Development, Medicine Hat, AB; ³Biostar Inc., Saskatoon, SK.

Crossbred bulls (n=60, average 307.5 kg, 9 mo of age), blocked by weight, were randomly allocated to either recombinant fusion protein with VSA adjuvant anti-GnRH vaccine (GnRH) or placebo (CTRL). Vaccinations were given on three occasions (Days 0, 56 and 112). Bulls were backgrounded for 84 d then fed a finishing diet for 100 d prior to slaughter. Average daily gain, feed intake and feed efficiency were not significantly different among treatments during backgrounding. However, during the finishing phase, average daily gain was greater ($P < .05$) for CTRL (1.70 vs. 1.34 kg d⁻¹) while feed efficiency improved in GnRH bulls (6.12 vs. 7.08 kg DMI kg gain⁻¹). There were treatment effects ($P < .01$) on testicular weight, daily sperm production, and epididymal sperm reserves. Average values for GnRH expressed as a percentage of CTRL were: testicular weight, 53; daily sperm production, 40; and epididymal sperm reserves, 16. There were treatment by time interactions ($P < .0001$) for scrotal circumference and serum testosterone concentrations. At slaughter, GnRH bulls had a smaller ($P < .0001$) scrotal circumference (28.3 vs. 33.9 cm) and lower ($P < .0001$) serum testosterone (2.2 vs. 8.6 ng ml⁻¹) than CTRL. Although immunization lowered carcass weight (6.9%; $P < .01$), the data show a concurrent improvement in carcass quality as lean yield was reduced by only 2.3% ($P < .05$). This improvement was primarily the result of a reduction in grade fat caused by immunization (6.9 vs. 7.5 mm). Further, shear force values were 16% lower in GnRH bulls suggesting increased tenderness. Vaccinating bulls against GnRH profoundly suppressed testicular function, with a slight improvement in feed efficiency and carcass quality.

Key Words: GnRH, Testis, Bulls

1081 Comparison of conventional and organic beef production systems: nutritional composition. M. I. Fernandez and B. W. Woodward*, *University of Minnesota, St. Paul.*

Claims such as "low fat" and "natural production" have persuaded consumers that "organic" foods are better. These beliefs are primarily based on perceptions. Nutritional composition of muscle, liver and kidney from steers raised in organic and conventional beef production systems were compared. Preconditioned crossbred steers from conventional (C; n=24) and low-input (O; n=30) farming systems were randomly assigned to organic (o) or conventional (c) feedlot systems. C calves were implanted and received lasalocid. Finishing treatment c included vaccination, deworming, implants, ionophore and conventional grains; treatment o included vaccination, and organic grains. Diets were formulated to have 1.41 Mcal/kg of NEg and 11.8% CP. Longissimus muscle (LM), kidney and liver tissue samples were taken 24 h postmortem and freeze dried. They were later thawed at room temperature and ground to 2 mm for mineral (ASH), fat (EE) and nitrogen (CP) determination. Production system was fit with initial age as a covariate (Model 1). LM data were also analyzed with LM area (LMA) or back fat (BFAT) fit as covariates. Model 2 (c vs o) was used to evaluate finishing treatment (age and initial weight (INWT) as covariates). Model 1 analyses showed no treatment effect ($P > .05$) on CP, EE and ASH from LM or kidney, although a consistent tendency existed for Cc and Oc steers to have higher CP and lower EE than Oo and Co steers. Adjusting for LMA or BFAT did not alter treatment effect on LM nutritional composition. Finishing treatment (Model 2) had no effect on CP or ASH of LM, kidney and liver. EE was similar for LM and liver, but o steers had higher ($P < .05$) kidney EE than c steers. After adjusting Model 2 for HCWT or DOF, least squares means showed no difference between finishing treatments for CP, EE or ASH content from LM, kidney and liver. These results show that beef from organically- and conventionally-finished steers had similar nutritional composition based on CP, EE and ASH.

Key Words: Organic, Nutritional Composition, Beef Production Systems

1082 Comparison of conventional and organic beef production systems: cost analysis. M. I. Fernandez* and B. W. Woodward, *University of Minnesota, St. Paul.*

As part of a comprehensive study that compared organic and conventional beef systems, feedlot costs were analyzed. Preconditioned crossbred steers from conventional (C; n=24) and low-input (O; n=30) farming systems were randomly divided into two groups and assigned to either organic (o) or conventional (c) feedlot systems. C calves were implanted and received lasalocid. Finishing treatment c included vaccination, deworming, two implants, ionophore and conventional corn and soybeans; treatment o included vaccination, and organic corn and soybeans. Diets were formulated to have 1.41 Mcal/kg of NEg and 11.8 % CP. Feed and yardage costs, veterinary expenses, purchase price and cost of gain were individually calculated for the period of time each steer was on feed. To analyze the production system from birth to slaughter, Model 1 included fixed treatment effect with initial age fit as a covariate. The feedlot phase was analyzed by fitting finishing treatment (Model 2: c vs o) with initial age and weight as covariates. Feed costs were the major determinant of total cost of gain, 79% for Co and Oo, 74% for Oc, and 73% for Cc. Feed cost of gain was similar ($P > .05$) for Cc and Oc steers, and lower ($P < .05$) than for Oo and Co steers, which also were similar ($P > .05$). Cc steers had the lowest ($P < .001$) yardage costs. Steers in the Co treatment group had the lowest ($P < .05$) veterinary costs and the other three groups had similar veterinary expenses. Oc steers gained the most weight, which was high enough to offset higher yardage costs due to increased DOF compared to Cc steers. Total cost of gain was lower ($P < .001$) for Cc and Oc than for Oo and Co steers. In Model 2, feed and yardage costs for o finishing were higher ($P < .001$) than for c finishing. It cost 39% more ($P < .001$) to finish steers organically due to lower ($P > .01$) gains and increased ($P < .001$) days on feed. Feed cost of gain accounted for most of the difference between c and o finishing systems; \$.99 vs \$1.50/kg, respectively.

Key Words: Organic, Feedlot Costs, Beef Production Systems

1083 Development of an indwelling ruminal transponder for electronic identification of beef cattle. T. A. McAllister*, C. L. Cockwill¹, J. McDowall¹, J. Yoakum², H. L. Stoddard², and D. Tischer³, ¹Agriculture and Agri-Food Canada Research Centre, Lethbridge, AB; ²AVID Inc., Norco, CA and ³AVID Canada, Calgary, AB.

Concern over animal/human health issues (e.g., *E. coli* 0157, bovine spongiform encephalopathy) and the desire to link carcass data to individual animals for improving beef quality and production consistency have prompted the North American beef industry to seek a reliable method of identifying individual animals. We evaluated the use of a passive radio frequency identification device transmitting a unique 8=digit code (AVID Inc., Norco, CA) as a ruminal bolus. The transponder (18 mm × 3.25 mm; broadcasting at 125 kHz) was embedded in resin and encased in ceramic to form a 69-g bolus with dimensions of 7.5 cm × 2.0 cm. Resilience of the boli, susceptibility to interference, minimum age of calves into which boli could be introduced, and retention and durability of boli in the rumen were investigated in three experiments involving six ruminally cannulated steers, 16 calves, and 144 feedlot heifers. Transponders were read with antennae mounted in a hand-held scanner (10-cm coil) or in the cattle handling chute (72-mm coil). After 217 d in the rumen, boli were discolored but fully functional. Hardware magnets or multiple boli in the rumen did not interfere with operation; when >1 boli were present in the rumen, the one closer to the antenna was detected. The boli could be introduced into and were retained by neonatal calves. Read success was 100/104 d. The extended range of the chute-mounted antenna (90 cm beyond the coil) enabled multiple reads of each animal passing through the chute. Boli from the heifers were retrieved at the slaughter plant. The epoxy affixing the polyethylene end caps was weakened, but the transponders remained functional. The bolus transponder provides tamper-proof identification that could serve as an alternative to branding for proof of ownership. Linking the system to a thermistor or pH probe may also enable collection of useful information on ruminal environment.

Key Words: Beef, Identification, Transponder

1084 Selection of replacement heifers based on the predicted reproductive risk and net present value. J. C. Whittier* and M. S. Meek, *Colorado State University*.

The objectives of this study were to: 1) determine the effectiveness of replacement heifer selection at weaning as a method to reduce reproductive risk; 2) determine reproductive risk factors based on body measurements that can be incorporated into an economic evaluation to make selection and marketing decisions. The effectiveness of selection at weaning was evaluated by imposing artificial selection decisions at three ranches at weaning. Both selected (S) and non-selected (NS) heifers were developed and exposed to mating to determine if the S group differed from the NS group in yearling pregnancy rate. At all three ranches S and NS heifers did not differ in yearling pregnancy rate. To determine reproductive risk factors based on body measurements, independent variables of breed type, weight (WT), hip height (HH), the ratio of weight to height (W/H), heart girth (HG), muscle score (MS), and condition score (CS), were obtained at approximately 9, 12, and 17 months of age at three ranches. Weight gains between periods were also obtained as independent variables. Yearling pregnancy (YP, n=835), live calf (LC, n=547), and two-year-old pregnancy (2P, n=494) data were collected as dependent variables. Logistic regression analysis was used to determine R²H and regression coefficients for YP, LC, and 2P, and the independent variables. In all three analysis (YP, LC, and 2P), the R²H values for the independent variables were very low (< 5%) indicating that selection based on the body measurements taken would have very little impact on reducing the reproductive risk associated with the heifers studied. Regression parameter estimates were used to determine the probability that a heifer would succeed reproductively. Net present value analysis was used to predict the lifetime profit of the heifer based on the probability of reproductive success and the opportunity cost of keeping the heifer. The inability to account for variation in reproductive success limits the value of using risk factors and NPV as a selection tool.

Key Words: Beef Heifers, Selection, Body measurements

1085 Computerized decision aid that facilitates evaluation of production response and economic return of using artificial insemination in a commercial beef herd. E. F. Londono, T. R. Kasari*, and J. M. McGrann, *Texas A and M University*.

A computerized spreadsheet was developed to help producers evaluate the projected production response and economic return of initiating an artificial insemination (AI) program in a commercial beef herd. The spreadsheet contained sequential worksheets that allowed alterable inputs for 1) date of production seasons (beginning and ending dates of calving, breeding, weaning) and calving distribution in 21 day intervals, 2) genetic profile of current natural service bulls and proposed AI bulls using expected progeny difference (EPD), in lbs, for growth and maternal traits, 3) total number of virgin heifers plus mature and primiparous females (collectively referred to as candidate cows) in cow herd that are ≥ 45 days post-partum at start of estrus synchronization, 4) body condition score (1=emaciated, 9=obese) of these females in categories 3-4, 5-6, and ≥ 7 immediately prior to estrus synchronization, and 5) cost per exposed candidate cow determination of different estrus synchronization programs based on cost of drugs, semen, labor, and additional miscellaneous costs. Information from these worksheets are transferred automatically into another worksheet in order to calculate projected pounds of calf weaned per exposed AI candidate cow and natural service cow. Historical weaning weights of natural service calves are basis for determining weight difference between sire groups. Annual ownership costs of natural service bulls are calculated in another worksheet. A summary worksheet compares the production and revenue generated from AI versus natural service progeny. Use of AI technology to boost pounds of calf weaned per exposed female is most attractive economically when a high percentage of females are in BCS ≥ 5 and ≥ 45 days post-partum at the start of estrus synchronization, and cows are mated to AI bulls with superior growth traits.

Key Words: Computerized Spreadsheet, Artificial Insemination, Beef

1086 Effect of calf removal on pregnancy rates of cows synchronized with the Ovsynch or CO-Synch protocol. T. W. Geary*, J. C. Whittier, and D. G. LeFever, *Colorado State University*.

Beef cows (n = 469) from two locations were stratified by breed, postpartum interval, age, and AI sire, and randomly allotted to one of four treatments for synchronization of ovulation. Ovulation synchronization protocols included the Ovsynch protocol with (n = 112; OVSCR) or without (n = 123; OVS) 48-h calf removal from d 7-9 or the CO-Synch protocol with (n = 119; COSCR) or without (n = 115; COS) 48-h calf removal from d 7-9. The Ovsynch protocol includes intramuscular administration of GnRH (100 μ g) on d 0, PGF_{2a}O (25 μ g) on d 7, GnRH (100 μ g) on d 9, and timed insemination on d -10. The CO-Synch protocol includes intramuscular administration of GnRH (100 μ g) on d 0, PGF_{2a} (25 mg) on d 7, and GnRH (100 μ g) plus timed insemination on d 9. Blood samples were collected from all cows on d -10 and d 0 for analysis of serum progesterone. Cows with at least one serum progesterone level greater than 1 ng/ml were considered to be cyclic at the time of treatment. Pregnancy rates of COSCR, OVSCR, COS, and OVS treated cows (63%, 62%, 55%, and 52%, respectively) were not different (P > .1). However, both estrual status and 48-hour calf removal affected pregnancy rates. Pregnancy rates of cyclic and anestrus cows, regardless of synchronization treatment, were 66% and 53%, respectively (P < .005). Regardless of synchronization treatment, pregnancy rates of cows with 48-h calf removal (62%) were greater (P < .05) than pregnancy rates of cows without calf removal (53%). These data provide producers with an ovulation synchronization protocol (COSCR) that induces a fertile ovulation in cyclic and anestrus cows, requires handling cattle just 3 times, and results in high pregnancy rates from a timed insemination.

Key Words: Synchronization of Ovulation, Artificial Insemination, Beef Cows

1087 Evaluation of estrous synchronization schemes using combinations of GnRH and prostaglandins. D. L. Hixon*, C. T. Talbott, and G. E. Moss, *University of Wyoming, Laramie*.

Range beef cow producers continually evaluate estrous synchronization protocols to identify methods which minimize input and maximize conception rates. The objectives of this study were to evaluate effects of three estrous synchronization regimens on conception rates at the synchronized estrus, during the first 25 d of the breeding season, and on overall conception rates in a 45-d breeding season. Angus x Gelbvieh beef cows were randomly assigned to one of three treatments after being stratified by d postpartum. Estrous synchronization protocols were: the double injection prostaglandin (PGF_{2a}) system which served as a positive control (PP; n=73; cows were bred by artificial insemination [AI] after detection of estrus following the second injection of PGF_{2a}); the Select Sires' "Select Synch" program (SS, n=74) which utilizes a GnRH injection followed by injection of PGF_{2a} on d 7 and AI after detection of estrus; and a modification of the SS scheme where at 48 h after PGF_{2a} injection, a second injection of GnRH was administered and AI concomitantly performed without detection of estrus (TI; n=73). Differences in pregnancy rates were determined by Chi-square analysis. More (P < .05) PP cows (57.5%) conceived at the synchronized estrus than SS cows (45.9%). There were no differences (P > .05) between PP and TI (49.3%) or SS and TI cows. More PP cows (72.6%) conceived after the first 25 d of the breeding season than SS cows (56.8%; P < .01). However, PP cows were not different from TI cows (67.1%; P > .05). Differences among SS and TI conception rates during the first 25 d approached significance (P < .10). Overall conception during the 45-d breeding season favored PP-treated cows (94.5%) over TI (83.6%; P < .01) cows, but did not differ from SS cows (89.2%; P > .05). Overall conception rates in SS cows tended (P < .10) to be greater than in TI cows. All three synchronization protocols provided acceptable levels of conception at the synchronized estrus, however, the double GnRH treatment (TI) resulted in a greater number of open cows at the end of the breeding season.

Key Words: Synchronization, GnRH, Prostaglandins

1088 Site of semen deposition and fertility in beef cows inseminated according to estrus or at a fixed time after synchronization with GnRH-PGF_{2α}. D. G. Gieger*, G. C. Lamb, T. G. Rozell, K. E. Thompson, and J. S. Stevenson, *Kansas State University, Manhattan.*

We evaluated the effect of site of semen deposition on pregnancy rate in beef cows inseminated at a fixed time or after observed estrus. Estrus was synchronized with a combination of gonadotropin-releasing hormone (GnRH) and PGF_{2α} (PGF). The trial was conducted at one location in Kansas (Angus × Simmental; n = 147) and one in Colorado (Angus × Hereford × Simmental; n = 313). Cows were assigned to be inseminated 12 h after first observed estrus (ESTRUS-AI) or at a fixed time (TIMED-AI). Cows in the ESTRUS-AI group were given 100 µg of GnRH (Fertagyl®) at d -7 followed by 25 mg of PGF on d 0 and observed for estrus twice daily until d 5. Similarly, cows in the TIMED-AI treatment were given GnRH at d -7 and PGF at d 0, but received a second injection of GnRH 48 to 56 h after PGF and were inseminated at that time. During insemination, semen was placed either in the uterine body (BODY) or in each uterine horn (HORN). Within the ESTRUS-AI treatment, neither conception rate (70% vs. 73%) nor pregnancy rate (39% vs. 40%) was different between BODY and HORN treatments. The pregnancy rate within the TIMED-AI group tended (P=.09) to be greater for BODY (53%) than HORN (42%) treatments. Pregnancy rate was greater (P=.03) for BODY cows in the TIMED-AI treatment (53%) compared to BODY cows in the ESTRUS-AI treatment (39%). We concluded that horn insemination had no effect on conception or pregnancy rate in cows bred according to estrus, and tended to decrease pregnancy rate in cows bred at a fixed time.

Semen deposition	ESTRUS-AI		TIMED-AI	
	BODY	HORN	BODY	HORN
No. of cows	119	118	115	108
Estrous response	66/119 (55%)	64/118 (54%)	—	—
Conceived to AI	46/66 (70%)	47/64 (73%)	61	45
Pregnancy rate	46/119 (39%) ^a	47/118 (40%) ^a	61/115 (53%) ^b	45/108 (42%) ^a

^{a, b} Uncommon superscripts differ (P<0.1)

Key Words: Beef Cows, Pregnancy, Horn Insemination

1089 Effects of muscular hypertrophy sires on fetal gestation and birth traits. R. A. Bellows*, M. A. Lammoglia, R. E. Short, S. E. Bellows, B. L. Shipp, D. A. Phelps, and R. B. Staigmiller, *USDA-ARS and Montana Agric. Expt. Sta., Miles City, MT.*

Sire and calf sex effects on fetal growth and dystocia were studied in 92 x-bred dams (varying % Red Angus, Hereford, Charolais, and Tarentaise) bred to Hereford (H, n=30), Piedmontese (P, n=32), or Belgian Blue (BB, n=30) sires. Dams were slaughtered at 182.5 ± .8d (n=31, Stage 1) or 242.6 ± .9d (n=28, Stage 2) of gestation or calved (n=33, Term). Analyses were by GLM-SAS within and between slaughter stages and within term births. Stage 1: all sire differences were nonsignificant (P>.10); fetus sex differences for heart girth (36.1 vs 40.9 cm), liver (205.1 vs 288.8 gm), kidney (46.0 vs 68.2 gm), heart (40.6 vs 58.0 gm), placentome (2.3 vs 2.9 kg) and placental membrane weight (92.2 vs 109.2 gm), and sire x sex for placentome number (H, 98.3 vs 88.0; BB, 92.8 vs 117.8; P, 85.6 vs 121.7) were all P<.05 (values female vs male). Stage 2: sire differences for intact fetus (H, 23.6; BB, 28.5; P, 24.7 kg) and brown adipose tissue wt (H, 130.1; BB, 156.4; P, 113.4 gm) were P<.05; fetus sex differences (female vs male) for placental fluid volume (7.6 vs 8.6 L) and placentome number (87.1 vs 111.0) were P<.05 as was sire x sex for placentome number (H, 90.2 vs 108.0; BB, 99.8 vs 98.6; P, 71.4 vs 126.5; female vs male). All sire and sire x sex differences in term calves were P>.10 except for gestation length (282.9 vs 285.5d, P=.09) and head circumference (50.0 vs 51.0 cm, female vs male). Sire effects on gestation length, birth weight, and dystocia were P>.10. Analyses over Stages 1 and 2 detected no significant sire x stage interactions in fetal measures or weights. Dam breed effects were P>.10. Part-whole fetal r values within Stage were P<.01. Within Stage 2, r values for intact and eviscerated fetus weights with dam carcass length were both -.37 (P=.05). We conclude: there is little evidence for sire effects on fetus size at two stages of gestation, at birth, or on dystocia, and relationships among fetus and dam carcass traits were minimal.

Key Words: Cattle, Conceptus, Growth

1090 Evaluation of extruded feeds as protein supplements for lactating beef cows. M. B. Larremore*, A. D. Herring, L. J. Hughes, K. J. Sanders, and C. R. Richardson, *Texas Tech University, Lubbock.*

The objectives of this study were to compare milk traits and weight change in lactating beef cows fed protein supplements of extruded cull cottonseed (ECC), extruded whole cottonseed (EWC), and cottonseed meal (CSM). Purebred Angus females (n=24) two to eight years of age were randomly separated into two groups mid lactation and were evaluated under drylot conditions. Cows were offered 15 kg/hd/d of low quality (7.5% CP) hay and fed CSM (1.36 kg/hd/d), ECC (2.73 kg/hd/d), or EWC (2.73 kg/hd/d). Two protein supplements were simultaneously fed for 12-14 day intervals where both groups received all three supplements over the six week trial. Cows were milked with a portable milking machine, and cows and calves were weighed at the initiation of the experiment and at the end of each time period. Calves were separated from cows 18 hr before milking. Cows ranged from 104 to 217 d postpartum across milkings at the ends of the three periods. Milk samples were analyzed for crude protein and milk fat. Milk yield, milk CP, and milk fat at the end of each period, calf weight gain per period and cow weight change per period were analyzed through repeated measures analyses of covariance using SAS. Independent variables included protein supplement, group, cow within group, and the regression on day of lactation. Cows receiving CSM had lower (P<.01) milk yield (3.3 ± .08 kg) than those receiving ECC (3.7 ± .08 kg) or EWC (3.7 ± .07 kg). No differences were seen in milk CP or fat among protein supplements. Cows receiving CSM gained more (P<.01) weight per period (10.3 ± 2.94 kg) than those receiving ECC (-4.2 ± 2.97 kg) or EWC (-5.4 ± 2.73 kg). No differences in calf weight gain were seen among cows receiving these three protein supplements. The regression on day of lactation was +.01 ± .005 kg/d for milk yield (P=.06) and +.03 ± .009 %/d for milk fat (P<.01). The day of lactation did not affect milk CP.

Key Words: Beef Cows, Milk, Extrusion

1091 Supplementation of young postpartum beef cows grazing dormant rangeland. L. A. Knox*, G. B. Donart, D. E. Hawkins, J. E. Sawyer, M. S. Brown, J. S. Serrato-Corona, E. E. Parker, and M. K. Petersen, *New Mexico State University, Las Cruces.*

The effects of cow age and the amount of undegradable intake protein (UIP) in supplements fed to young postpartum beef cows grazing dormant rangeland was investigated. The experimental design was completely randomized with a 2x2 factorial arrangement of treatments. Cows were stratified across treatment by breed and calving date. Forty-eight 3 year old and forty-five 2 year old beef cows grazing in the same pasture were randomly assigned to two protein supplements. Supplements were control (CON, 359g/hd·d⁻¹ CP: 126g/hd·d⁻¹ UIP) and high UIP (359g/hd·d⁻¹ CP:180g/hd·d⁻¹ UIP). Protein sources used were cottonseed, fish, blood meal and urea. Supplements were formulated to be isoenergetic and to maintain similar ruminal function. Cows were individually fed both supplements at 3.6 kg per feeding twice a week. A 60 day breeding season was used. Cow weight, body condition score, calf body weights, milk production, fecal output, serum non-esterified fatty acid concentration (NEFA), and length of anestrus (P>0.15) were similar for cows fed both supplements. However, more 2 year old cows fed UIP supplement were pregnant in the fall than cows fed CON (91 vs. 72%, P=0.11). Seventy-nine percent of the 3 year olds were pregnant regardless of supplement fed. The 3 year old cows had a shorter anestrus period compared to the 2 year olds (84 vs. 117d, P<0.01). The older cow's calves weighed more than the younger cow's at weaning (212 vs. 251kg, P<0.01). Age had no effect on milk yield, but the 3 year old cows had lower serum NEFA concentrations, and higher fecal output (P<0.10). Three year old cows did not respond to increased amounts of UIP. More two year old cows fed UIP were pregnant in the fall.

Key Words: Beef Cattle, Pregnancy, Protein

1092 Evaluation of supplementation for growing cattle grazing native rangeland. E. E. Grings*, R. E. Short, and R. K. Heitschmidt, *USDA-ARS, Miles City, MT.*

Summer grazing trials were conducted during two years to test the value of supplementation with two protein sources for yearling steers grazing late season native range compared to unsupplemented controls. Each year, 56 yearling steers (288 kg) were allotted to one of four treatments in three pastures. Each treatment was represented within each pasture. Steers received a 200-d estradiol implant at the beginning of the study. Stocking rate was based upon Natural Resource Conservation Service guidelines for range sites in good condition and assuming a 4-month grazing period. Once each month forage intake was estimated using total collection of feces from two steers from each treatment-pasture combination (24 steers per year). Diet quality was determined monthly using esophageally cannulated yearling heifers. Treatments were control, 1.5 kg safflower-based supplement (22.0% CP), 1.2 kg soybean meal-based supplement (25.8% CP), and 1.2 kg safflower and soybean meal based supplement (25.8% CP). Steers were individually fed supplement once every third day. Grazing began in mid-May. Dates of supplementation were 16 August to 4 October, 1993 and 18 July to 8 September 1994. Crude protein intake was increased above controls ($P < .01$) an average of 92 g/d by supplementation. Forage IVOMD declined from 72 to 56% and CP declined from 16.6 to 7.8% between the beginning and end of the grazing season. No differences were observed in weight gains, forage intake or digestibility among the treatments ($P > .10$). Weight gain averaged 1.19 kg/d before and .74 kg/d during the supplementation period. Forage intake differed by year for the late summer supplementation period ($P < .01$) but not during the early summer grazing period ($P > .10$). Forage intake averaged 19.0 g/kg BW before supplementation. During supplementation, forage intake averaged 21.2 g/kg BW in 1993 and 18.7 g/kg BW in 1994. Supplementation was not beneficial to weight gain of yearling cattle grazing forage of the quality and quantity observed in this study.

Key Words: Grazing, Intake, Protein

1093 Early summer deworming of cows and nursing beef calves affects summer weight gain. G. E. Selk*, K. C. Barnes, and B. R. Stacey, *Oklahoma State University, Stillwater.*

Five deworming trials were conducted at the Eastern Research Station located at Haskell, OK during 1992 through 1996. Crossbred cows and their Charolais sired calves were blocked by sex of calf, calf age and cow age then randomly allotted to three treatments: 1) non-dewormed control, 2) deworm calf only; 3) deworm cow only; and 4) deworm cow and calf. Two or three treatments were applied each year including one control group. Each treatment was applied two or three years. Cows and calves were individually identified and weighed in early June. Treated animals received label-recommended dosages of ivermectin pour-on. Pairs grazed in rotation seven bermudagrass pastures overseeded with clover at a stocking rate of .81 hectare acres per cow during the 144 to 148-day trials. Initial studies indicated that a low worm infection rate was present in 1991 and 1992. At that time fecal egg counts ranged from 0 to 28 eggs per 3 gram sample of feces. Data were analyzed by General Linear Model Procedures. Deworming cows in late spring had no significant effect on cow summer weight gains until calf weaning time. Treating cows but not their calves resulted in a small advantage in average daily calf weight gains (.045 kg; $P=.1$), while treated spring-born calves had significantly greater daily weight gains (.069 kg; $P<.04$) while nursing non-treated cows. Treated calves nursing treated cows had significantly greater average daily weight gains (.077 kg; $P<.003$) than the untreated calves nursing untreated cows. Deworming spring born nursing calves in early summer resulted in significantly greater summer weight gains.

Key Words: Beef Cow, Calf, Deworm

1094 Effect of sustained-release ivermectin on performance of grazing cattle in the intermountainwest. P. A. Momont*, F. L. Edmiston, G. C. Keetch, J. N. Hawkins, and W. F. Hazen, *University of Idaho.*

Five studies (trials I to V) were conducted on ranches located in the intermountain west to determine the effect of sustained-release parasite control (Ivomec SR Bolus®, MERIAL) on cattle performance. Cattle in trials I to IV grazed irrigated intermountain meadow for 156 d (n=250 yearling heifers), 117 d (n=250 yearling steers), 85 d (n=150 yearling heifers) and 85 d n=60 calves), respectively. In trial V, yearling steers (n=200) grazed dry high desert range for 190 d. Initial and final weights and initial and final fecal samples were taken in each trial. Cattle were blocked by weight and randomly assigned to treatment 1) Control = ranch's current deworming program, or 2) SR Bolus = sustained-release ivermectin. Treatment effects were determined using GLM and Paired T-Test analyses. Initial weight, total gain difference (SR Bolus minus Control) and ADG difference, respectively, were for trial I 259.7 kg, +10.0 kg and +.064 kg/d ($P=.0003$); trial II 310 kg, +13.9 kg and +.119 kg/d ($P=.0001$); trial III 280 kg, +6.9 kg and +.082 kg/d ($P=.008$); trial IV 136 kg, +8.0 kg and +.095 kg/d ($P=.05$); and trial V 219 kg, -.48 kg and -.003 kg/d ($P=.86$). For trials I to V, mean initial, final Control and final SR Bolus fecal egg counts in eggs/gm were .4, 15.2 and 0.0; 6.0, 8.3 and 0.0; 75.8, 57.0 and 0.0; 76.0, 39 and 0.0; and 1.8, 2.0 and 0.0; respectively. Treatment of cattle grazing irrigated mountain meadows with sustained-release ivermectin resulted in improved weight gains and fecal egg counts were diminished to near zero. No difference in weight gains were detected for cattle administered sustained-release ivermectin that grazed dry high desert range.

Key Words: Cattle, Beef, Anthelmintic

1095 Farm and industry impacts from the Missouri Show-Me Select Heifer Program. D. J. Patterson, V. L. Pierce*, R. F. Randle, R. L. Larson, M. S. Kerley, and W. O. Herring, *University of Missouri, Columbia.*

Marketing heifers that are developed according to established guidelines has been shown to be a viable means of rural economic development in other regions of the country. Producers in Missouri established the Show-Me Select Heifer Program with the objectives to; 1) improve existing heifer development programs through Total Quality Management, 2) Provide a reliable source of quality replacements (genetics and management), and 3) Increase marketing opportunities for and add value to Missouri-raised heifers. Pre-breeding examinations for heifers enrolled in the program were conducted. Herd results were made available to producers to identify associated problems, and provide recommendations on breeding programs. Pregnancy examinations to determine fetal age were performed prior to 120 days of gestation. Each producer received individual and summary data from the pregnancy examinations. Summaries are reported in this paper. A total of 1873 heifers were enrolled in the program with 518 animals consigned for two separate program sales. The two sales brought total revenue to the participating producers of \$ 410,675. The bred heifers brought an average price of 864 and 789 dollars at the two sales in late 1997. The impact of value added practices is reported including an average premium for AI of 126 and 135 dollars at each of two sales. Buyer surveys conducted during the sale were analyzed to demonstrate the demographics of buyers that paid premiums for value added characteristics and to help consignors understand which characteristics offer the greatest reward to management.

Key Words: Beef Cattle, Replacement Heifers, Economics

1096 Elk impacts on beef enterprise profitability. M. W. Tess* and W. L. Fuller, *Montana State University*.

Computer simulation was used to determine the effects wild elk on available forage, cow herd size, gross margin, and unit cost of production (\$/kg sold) in Southwestern Montana beef cow-calf production systems. Forage intake by elk was simulated dependent on animal age, sex, physiological state, and forage quality, and expressed in animal unit months (AUM = 360 kg DM/mo) after accounting for dietary overlap between elk and cattle. Data collected from five Southwestern Montana ranches were used to develop input parameters for a dynamic bio-economic model of beef production. Input parameters described ranch resources and animal management. Cattle herd size ranged from 240 to 1194 cows exposed. Elk numbers varied by season within ranch and ranged from 49 to 421. Ranches were simulated as currently managed with elk present and with elk removed. Simulated management scenarios were replicated 10 times. Data were analyzed by least squares procedures, accounting for the effects of elk, ranch and elk x ranch interaction. Herd size, gross margin, and available AUM significantly ($p < .01$) increased when all elk were removed; however, the magnitude of these effects differed among ranches. Unit cost of production differed among ranches but was not affected by removal of elk or interaction effects. Removal of all elk permitted cow herd size to increase from 8 to 45%. Annual costs of elk on the five ranches (i.e., increase in gross margin from elk removal) ranged from \$3,892 to \$19,392. On an AUM basis, elk costs ranged from \$8.42 to \$14.63. Elk can significantly reduce profits for cow-calf ranches in Southwestern Montana. Elk costs are closely associated with efficiency of resource use by cattle - i.e., ranches with lower unit costs of production lose gross margin by providing forage for elk. Elk costs estimated in this study are potentially recoverable by a variety of management strategies.

Key Words: Cattle, Elk, Profit

1097 Seasonal effects on the usage, moisture, $\text{NH}_3\text{-N}$, and microbial ecology of pelleted newspaper, wheat straw and wood shavings when used to bed horses. P. L. Ward*, J. E. Wohlt, and S. E. Katz, *Cook College, Rutgers University, New Brunswick, NJ*.

Pelleted recycled (municipally curbside collected) newspaper (2.54 x .32 cm), baled wheat straw (boot stage) and kiln dried pine wood shavings were compared as bedding materials in 14 d periods for 9 mature horses. A 3x3 replicated Latin square design over two seasons was used (average barn temperature and % relative humidity: Summer 17.5°C, 78%; Fall 7.8°C, 68%). Depths of bedding were: pellets ~1.8 cm; straw ~18.6 cm; shavings ~6.4 cm. Stalls were cleaned daily of feces and wet spots. Remaining bedding was mixed, stacked for 2 h equilibration and then sampled; redistribution with new additions of bedding was made only if moisture exceeded 25% or volume was insufficient for animal cleanliness. In the Fall, usage of bedding (initial + added) was increased (22%, $P < .01$), and concentrations of $\text{NH}_3\text{-N}$ in the breathing zone increased 5.2 vs. 3.6 ppm ($P < .01$) over Summer. On d 14 during the Fall, samples of air collected in the breathing zone, washes of legs and swabs of the nasal cavity obtained from horses contained higher counts of microorganisms than found in Summer. In all categories of bedding materials, wood shavings had higher organism levels than did straw or pellets during the Fall. Barn windows and doors were open during the Summer vs. closed during the Fall resulting in lowered air circulation which may have contributed to observed effects.

Key Words: Animal Bedding, Pelleted Newspaper, Seasonal Effects

1098 A method to increase the number of cyclic yearling heifers at the beginning of the breeding season. D. G. LeFever*, D. W. Schafer, G. L. Mathiews, J. C. Whittier, and T. W. Geary, *Colorado State University, Fort Collins*.

This paper summarizes three trials that involved feeding melengestrol acetate (MGA) to yearling heifers prior to an estrous synchronization period followed by a five d artificial breeding period. The objective was to increase the number of heifers that had cycled, or were nearing their first estrous cycle by 32 d before breeding. By having more heifers cycling before breeding, there would be a greater likelihood that pregnancy rate would be higher for the treated heifers. In all three trials, treated heifers received .5 mg MGA/head daily. The method used for synchronizing estrus utilized the MGA - prostaglandin system. Results are shown in Table 1 for the three trials.

Table 1. Trial summaries for MGA pretreatments.

Trial No.	No. Head	Avg age at start (mo)	Duration of feeding (d)	Pretreatment to breeding (d)	Cycling or near cycling 32 d before breeding ² (%)	Pregnancy rate 5 d (%)
1 Treated	50	11.5	7-7 ¹	83-64	86*	52
Nontreated	51		0		74	65*
2 Treated	82	10.9	7	85	48**	41
Nontreated	84		0		21	37
3 Treated	50	13.4	9	56	58***	54*
Nontreated	49		0		18	39

*Significant difference ($P < .20$) **($P < .001$) ***($P < .0001$)

¹H Two 7-day periods 13 d apart

²H Determined by RTS

Key Words: Puberty, Melengestrol Acetate, Pregnancy Rate

1099 Effects of recombinant bovine somatotropin administration on production characteristics of lactating ewes. D. K. Aaron¹*, D. G. Ely¹, W. P. Deweese¹, E. Fink¹, and J. L. Garrett², ¹*University of Kentucky, Lexington* and ²*Animal Sciences Division, The Monsanto Company, St. Louis, MO*.

Twenty-four, multiparous, spring-lambing Polypay ewes (73 kg), each with twin lambs, were used to determine effects of recombinant bovine somatotropin (bST, sometribove) on production characteristics during one lactation. Each ewe and her lambs were randomly assigned, at 5 d postpartum, to individual pens in an open-sided barn. Ewes had ad libitum access to a complete mixed diet from 0800 to 0900 and 1600 to 1700 each day. Lambs were removed from ewes during these periods to prevent dry feed consumption. Ewes and lambs were individually weighed and ewes were condition-scored and machine-milked every 7 d from d 11 through 67 of lactation. Weekly feed intakes were recorded. On d 25, 39, and 53, ewes received either 160 mg of bST ($n = 12$) or an oil placebo (CON; $n = 12$) via s.c. injections. By d 46, estimated 24-h milk production was higher for bST ewes than for CON ewes (3431 vs 3158 g; $P < .10$), and bST ewes continued to produce more milk on each of the remaining collection days [d 53: 3278 vs 2940 g ($P < .05$); d 60: 3612 vs 2659 g ($P < .01$); d 67: 3348 vs 2387 g ($P < .01$)]. Milk production efficiency was also greater for bST ewes on d 46 (.84 vs .74; $P < .10$), 53 (.79 vs .66; $P < .05$), 60 (.82 vs .57; $P < .01$), and 67 (.78 vs .51; $P < .01$). With respect to lactation persistency, milk yield decreased at a slower rate for bST ewes (76 vs 168 g/7-d period; $P < .01$) from d 25 through d 67. Milk fat and DM contents were similar for both groups; however, milk protein content was lower ($P < .05$) for bST ewes on d 32, 46, and 53. Ewes in both groups tended to gain weight and condition, but no significant treatment differences were found. Although bST ewes had higher milk yields than CON ewes, no differences were found for twin lamb gain. Neither mastitis incidence nor milk somatic cell count was affected by bST treatment.

Key Words: Ewes, Somatotropin, Lactation

1100 Using methscopolamine bromide at weaning to reduce milk yield of ewes supplemented with and without recombinant bovine somatotropin. D. K. Aaron, D. G. Ely*, W. P. Deweese, and E. Fink, *University of Kentucky, Lexington.*

Treatment strategies involving methscopolamine bromide (MB) were assessed as means of reducing milk production in ewes at weaning. On d 67 postpartum, 24 spring-lambing Polypay ewes (81 kg), previously supplemented with (bST; n = 12) or without (CON; n = 12) recombinant bovine somatotropin, were allotted to three MB treatments (MB4, MB2, SAL). From d 67 to 74, ewes were fed a restricted diet of 1.8 kg alfalfa hay daily. Lambs were weaned on d 74 and ewes were placed in drylot without feed or water. Ewes in the MB4 group (n = 8) received s.c. injections of 48 mg MB in 2 mL saline at 1330 on d 72 and 73 and at 1020 and 1330 on d 74; MB2 ewes (n = 8) received saline injections at 1330 on d 72 and 73 and 96 mg MB at 1020 and 1330 on d 74; SAL ewes (n = 8) received 2-mL saline injections each time. All MB ewes received a total of 192 mg. Ewes were milked 180 min after the final MB treatment (1630, d 74) and yields (3-h) determined. At 1630 on d 76, residual milk yields were recorded. Jugular blood samples were collected prior to treatment (1040 and 1630, d 71); 40 and 180 min after each injection on d 72, 73, and 74; and 1040 and 1630 on d 75 and 76. Milk yields at 1630 on d 74 were 42 g lower for MB-treated than for SAL ewes (146 vs 188 g; $P < .01$). No difference was found between yields of MB4 and MB2 ewes. The MB ewes continued to produce less milk than SAL ewes at 1630 on d 76 (118 vs 169 g; $P < .06$), but yields of MB4 and MB2 ewes were similar. Neither previous bST treatment nor the bST $\times$ MB interaction was significant for milk yield at any collection time. Serum concentrations of growth hormone (GH) were not affected by MB treatment, but bST ewes tended to have higher GH levels than CON ewes. These results demonstrate the effectiveness of MB for reducing milk production in ewes. However, MB did not consistently decrease GH concentrations.

Key Words: Ewes, Somatotropin, Weaning

1101 Supplementing feathermeal and bloodmeal to increase protein intakes and change performance of postpartum range ewes. L. Appeddu-Richards*, J. B. Richards, A. M. Encinas, M. Salisbury, and M. K. Petersen, *New Mexico State University, Las Cruces.*

Changes in postpartum ewe status via supplementation of low quality diets with extra UIP from feathermeal(FM) and bloodmeal(BM) were investigated. Treatments were low UIP control(C); cottonseed meal(CSM); 15%FM:2.4%BM (FM15); 30%FM:4.8%BM (FM30); and 45%FM:7.2%BM (FM45). Ewes consumed hay (< 5%CP) offered at 2.5% initial BW (avg ewe = 55 kg). Supplemental N levels were increased in periods 1 and 2 via increasing UIP (avg 6,10,10,14, and 17 g N/48 h for C, CSM, FM15, FM30, and FM45). A non-supplemented(NS) treatment was used in period 2 only. In period 3, supplements were fed for equal N intakes above C with increasing UIP:DIP (6,13,13,13, and 13 g N/48 h). Supplements were isocaloric. Ewes were milked in periods 1 and 2 on d 27 and 53 postpartum. Serum samples were analyzed for growth hormone(GH) and insulin(INS) from a 6-h intensive on fasted ewes, and INS from samples collected every 6 h for 48 h post-supplementation. Ewes fed FM30 and FM45 produced more ($P = .12$) milk in period 1, but no body traits were changed. GH was higher ($P = .09$) for FM45 vs FM30, but INS lower ($P = .03$) for CSM vs FM15 in fasted samples. No changes in milk yield occurred in period 2, but ewes fed FM45 had positive changes ($P < .01$) in ultrasound measures of muscling and fat. The NS-fed ewes had the lowest INS in fasted ($P = .11$) and post-feeding ($P = .17$) samples. The highest GH values were in NS and CSM serum. In period 3, ewes fed: FM15 and FM30 gained the most weight ($P = .15$); CSM and FM15 had increased muscling ($P = .04$); and CSM, FM15, FM45 had increased fat ($P < .15$). C-fed ewes had the highest ($P = .17$) GH and lowest ($P = .09$) INS fasted levels. INS increased in ewes fed CSM and FM45. Differences in GH and INS illustrate supplementation can affect hormone secretion not only post-feeding, but also in a fasted state. Supplementing protein in low quality diets can increase milk production without decreasing ewe body reserves in early lactation, but can positively change ewe status in later lactation.

Key Words: Protein, Ewe, Lactation

1102 Effect of pasture management and season on gastrointestinal nematodes in hair sheep in the tropics. R. W. Godfrey*, J. R. Collins, E. L. Hensley, and M. B. Adjei, *University of the Virgin Islands, Agricultural Experiment Station, St Croix.*

The effect of a rotational pasture management system and stocking rate (SR) on nematode infection of sheep during the rainy and dry seasons of the year on St Croix was evaluated over a 2-yr period. Hair sheep lambs (6 mo of age) were grazed on guinea grass (*Panicum maximum*) pastures (.2 ha) at three SR (low = 551 ± 13 (n = 6), medium = 643 ± 9 (n = 3) and high 773 ± 13 (n = 3) kg/ha). Three of the medium SR pastures and all of the high SR pastures were subdivided into six paddocks (.03 ha). The sheep grazed each paddock in a rotation of 7 d grazing followed by 35 d of rest to yield a 42-d grazing cycle. The animals were weighed at 6-wk intervals and adjustments were made using the put and take system. All sheep in each pasture were treated with anthelmintic prior to the start of grazing. Every 14 d, fecal samples were collected from the same 2 sheep in each pasture and analyzed by the McMaster method. Fecal egg count (FEC) was expressed as eggs/g of feces and data were analyzed after a logarithmic transformation by $\log_{10}(\text{FEC}+1)$. Sheep had higher ($P < .0001$) FEC during the rainy season than during the dry season ($1.57 \pm .08$ vs $1.07 \pm .08$, respectively). Sheep were heavier in the dry season than in the rainy season ($25.5 \pm .3$ vs $22.6 \pm .3$ kg, respectively). Sheep grazing in the rotation pastures had higher ($P < .01$) FEC than sheep in the continuous grazing pastures ($1.47 \pm .08$ vs $1.17 \pm .08$, respectively). Sheep grazing pastures in the rotation system weighed less ($P < .002$) than sheep in the continuous grazing. Stocking rate did not affect FEC ($P > .10$), but sheep in the high SR pastures weighed less than sheep in the low or medium ($P < .03$). Body weight was negatively correlated with FEC ($P < .0001$) during both seasons ($R = -.356$). These results indicate that during the rainy season on St Croix the nematode burden on sheep is greater and can lead to a decrease in body weight.

Key Words: Sheep, Parasites, Environment

1103 D- α -tocopherol does not influence first service conception rates, pregnancy rates and prostaglandin release in ewes. C. L. Schultz*, T. T. Ross, M. W. Salisbury, and K. D. Kirby, *New Mexico State University, Las Cruces.*

Vitamin E has been shown to decrease the synthesis and release of prostaglandin (PG). This study was conducted to determine if D- α -tocopherol (vit E) will enhance first service conception rates and overall pregnancy rates. Eighty-six Suffolk ewes, ages 2-5 years, were randomly assigned to one of two treatments: 1500 IU (i.m.) vitamin E (n=45) or a control consisting of no vitamin E (n=41). An ad libitum alfalfa hay diet was available to all ewes. Forty-one of the 86 ewes were estrually synchronized using a Syncro-Mate B implant, 20 in control group and 21 receiving vit E. All ewes were bred to one of four rams fitted with a marking harness for estrus detection. Vitamin E was injected 9-11 d post estrus. Pregnancy was determined via ultrasound. Vitamin E did not effect pregnancy rates or first service conception rates ($P > .4$). Ewes in the receiving no vit E group nor an implant had higher first service conception rates ($P < .01$) than all other groups. Ewes not implanted showed higher first service conception rates ($P < .1$) than implanted ewes. A second trial was conducted to study the effect of vit E on $\text{PGF}_{2\alpha}$ release. Thirty white face ewe lambs received one of eight treatments: 1) no vit E or Se; 2) 250 IU vit. E animal⁻¹.d⁻¹ (low); 3) 500 IU vit. E animal⁻¹.d⁻¹ (med); 4) 1000 IU vit. E animal⁻¹.d⁻¹ (high); 5) Se enriched yeast; 6) Se and 250 IU vit. E animal⁻¹.d⁻¹; 7) Se and 500 IU vit. E animal⁻¹.d⁻¹; 8) Se and 1000 IU vit. E animal⁻¹.d⁻¹. Lambs were randomly assigned to treatments and treatments randomly assigned to pens. Lambs were fed for a total of 82 d. Lambs were euthanized and caruncular endometrial explants were removed, cultured, and analyzed for $\text{PGF}_{2\alpha}$ using an enzyme immunoassay. Treatments did not effect PG concentrations ($P > .4$). Therefore, supplementing with vitamin E does not appear to increase pregnancy rates nor first service conception rates.

Key Words: Ewe, Vitamin E, Prostaglandin

1104 Influence of oral administration of vitamin E on lamb survival, body weight, and serum vitamin E. J. T. Daniels*, P. G. Hatfield, R. W. Kott, and D. E. Burgess, *Montana State University, Bozeman.*

Twin lambs (n = 580) were used in a completely randomized design to determine the influence of orally administered vitamin E (Hoffman-LaRoche, dl-alpha tocopherol acetate) on lamb BW, survivability, and serum vitamin E concentrations. Treatments were: 1) one twin lamb was assigned randomly to receive a single dose of vitamin E (391 IU) within 6 h of birth (SD), 2) the other twin received no vitamin E (CON), and 3) of those lambs that received the single dose, half were assigned randomly to receive a second dose of vitamin E 10 to 18 h after the first dose (TD). A single blood sample was obtained from each lamb 3 d after birth. Sera were analyzed for vitamin E. Lambs were weighed at birth, 30 d of age, and at weaning (120 d of age). The model for BW included treatment, sex, breed, and all interactions. Lamb birth date and weight were included as covariates. Lamb survival was analyzed using Chi square. Serum vitamin E concentration was higher ($P < .001$) in TD lambs (6.1 ppm) than SD lambs, which had higher ($P < .001$) serum vitamin E concentration than CON lambs (3.2 and 1.4 ppm, respectively). Sex x treatment interaction was detected ($P < .10$) for 30- and 120-d BW when dead lambs were included in the analysis with a BW of 0. Lamb BW at 30- and 120-d did not differ ($P > .17$) among female lambs, but BW for TD male at 30- (12.0 kg) and 120-d (31.2 kg) was greater ($P < .07$) than CON males at 30- (10.5 kg) and 120-d (28.0). Lambs receiving the SD treatment were intermediate in 30- and 120-d BW but did not differ ($P > .31$) from either TD or CON lambs. Death loss was lowest ($P < .08$) for males that received TD. Death loss for CON, SD, TD female and male lambs was 11.8, 13.6, 16.2, 12.8, 10.6, and 3.8%, respectively. Two oral doses of vitamin E improved survival of male but not female lambs.

Key Words: Vitamin E, Twin Lambs, Lamb Survival

1105 Serum, growth, and semen traits of ram lambs fed locoweed and treated with vitamin E/selenium. J. B. Richards*, D. M. Hallford, G. C. Duff, H. J. Al-Tamimi, J. A. Hernandez, and K. L. Shirley, *New Mexico State University, Las Cruces.*

Sixteen Debouillet ram lambs (60 ± 3 kg, 5 mo old) received one of four treatments (2 x 2 factorial, 4/group) to examine effects of dietary locoweed (LW, *Oxytropis sericea*) and (or) vitamin E/selenium (MUSE) on growth and reproductive responses. Treatments were: control (50% concentrate diet; no LW, no MUSE), LW (20% dietary LW for 21 d, no MUSE), MUSE (2 mL of MUSE containing 5 mg Se and 50 mg Vit E/mL [i.m., Schering-Plough] on d 21 and 35 [d 0 = first day of trial]), and LW+MUSE. Animals were maintained under ambient conditions in individual pens (3x9 m) and allowed free access to feed, water, salt, and shade. Intake (daily) and BW (weekly) were recorded and serum (weekly) and semen (bi-weekly, electroejaculation) were collected. No LW x MUSE interactions were detected ($P > .10$). Locoweed toxicosis was assessed by examining serum alkaline phosphatase (AP) and thyroxine (T_4). On d 7 after initiating LW, serum AP was 115 and 807 (± 78) units and serum T_4 was 64 and 39 (± 3) ng/mL in rams receiving control and LW diets, respectively ($P < .01$). Serum AP remained elevated and T_4 reduced in LW-fed rams during the 21 d of LW feeding. Treatment with MUSE did not influence ($P > .10$) AP or T_4 . Feed intake was similar ($P > .10$) in controls and those fed LW during the 21-d LW feeding period (1.7 ± 1 kg/d) but LW-fed rams had reduced ($P < .05$) intake for the 2-wk period after LW feeding ended. Intakes in animals receiving MUSE were similar ($P > .60$) to those observed in controls. Consumption of LW did not reduce BW until 2 wk after LW feeding ended at which time controls weighed 53 kg compared with 48 (± 1.4) kg for LW ($P < .05$). Ram BW was not affected by MUSE ($P > .50$). No major effects of either LW feeding or MUSE injection were observed on semen traits during the 2 mo following treatment. Ingestion of LW at 20% of diet for 21 d decreased subsequent intake and growth responses and MUSE did not alleviate these adverse effects.

Key Words: Locoweed, Thyroxine, Reproduction

1106 Ultrasound evaluation of Suffolk-cross ram and ewe lambs from birth to 180 d of age. K. Stanford*¹, D. R. C. Bailey², S. D. M. Jones³, and M. A. Price⁴, ¹*Animal Industry Division, Alberta Agriculture, Food and Rural Development, Lethbridge, AB*, ^{2,3}*Agriculture and Agri-Food Canada, Charlottetown, PE* and ³*Lethbridge, AB*, ⁴*University of Alberta, Edmonton, AB.*

The effects of age and gender on longissimus muscle development in lambs were investigated by collecting biweekly ultrasound measurements of longissimus muscle area (LA), longissimus muscle width ('A'), longissimus muscle depth ('B') and backfat depth ('C') on 74 Suffolk-cross ram and ewe lambs from birth to 180 d of age. All measurements were made at the first lumbar vertebra. Lambs were born and raised as twins from mature ewes (mean weaning age 65 d). Lambs were given a pelleted creep feed (18.5% CP) free choice until weaning, then were provided *ad libitum* access to a barley-based grower diet (14.5% CP). Ewe lambs grew more slowly ($P < .001$) than ram lambs (284 ± 7 g d⁻¹ vs 330 ± 8 g d⁻¹), and consequently had lower ($P < .005$) liveweights beyond 90 d of age. However, LA, 'A' and 'B' did not differ between ram and ewe lambs until 180 d of age. From regressions by sex with age, age², weight and weight², only age was identified as a meaningful predictor ($P < .15$) of LA, 'A', 'B' or 'C'; explaining 81, 75, 76 and 63%, respectively, of the variation associated with these ultrasound measurements for ram lambs. Adjusting ultrasound measurements by liveweight may result in a bias toward ewe lambs, when measurements are made between 90 and 180 d of age. Adjusting ultrasound measurements for differences in age would be recommended for rapidly growing Suffolk-cross lambs within a single management/contemporary group.

Prediction ^a	Sex	R ²	RSD	Equation ^b
Longissimus area, LA (cm ²)	ram	.81	1.48	LA = .07 age + 2.73
	ewe	.77	1.60	LA = .06 age + 2.77
Longissimus width, 'A' (mm)	ram	.75	.47	'A' = .02 age + 3.28
	ewe	.73	.53	'A' = .02 age + 3.15
Ribeye depth, 'B' (mm)	ram	.76	.28	'B' = .01 age + 1.28
	ewe	.73	.29	'B' = .01 age + 1.29
Fat over longissimus, 'C' (mm)	ram	.63	.08	'C' = .002 age + .077
	ewe	.66	.07	'C' = .002 age + .067

^aAll measurements made at first lumbar vertebra. ^bOf age, age², weight and weight², age was the only significant predictor of LA, 'B', 'A' or 'C' ($P < .15$).

Key Words: Ultrasound, Lambs, Carcass Composition

1107 The effect of melatonin on progesterone-induced estrous synchronization in anestrus ewes. C. A. Daley¹, W. R. Patton¹, D. A. Daley¹, J. J. Linfor², and T. E. Adams², ¹*California State University, Chico* ²*University of California, Davis.*

The effect of melatonin [M] exposure on progesterone [P4]-induced estrous synchronization was examined in anestrus ewes. Thirty-four Suffolk and 65 Polypay ewes were segregated by breed and randomized by age to 1 of 4 treatment groups. Animals in treatment groups 2 and 4 received 3 successive M-containing implants (Regulin; 18 mg) at 30 d intervals beginning March 1. Animals in treatment groups 3 and 4 received P4-containing implants (Synchromate B) on June 1. Progesterone implants were removed 12 d after insertion. Control animals [C] (trt group 1) received neither M nor P4. Upon P4 implant removal, ewes were separated by treatment into 1 of 4 breeding pastures and exposed to rams for 60 d. All Suffolk ewes (8 of 8) receiving M and P4 in combination conceived during the 60 d breeding period. In contrast, conception rates were 0 of 8, 1 of 9, and 4 of 9 in C, M or P4 treated ewes, respectively. Although MP treatment produced a higher lambing rate (13 of 17) among Polypay ewes as compared to C ewes (5 of 17), there was no statistical difference in lambing rates between MP, M or P4 treated ewes (13 of 17, 11 of 18, 10 of 18, respectively). The combined treatment of M and P4 may enhance fertility during the nonbreeding season.

Key Words: Melatonin, Anestrus, Ewe

1108 Performance, carcass characteristics, feed efficiency and cost of gain comparisons in lambs sired by rams excelling in growth or maternal traits. M. E. Benson*, B. D. Banks, and A. P. Rahn, *Michigan State University, East Lansing.*

The objectives of this study were to compare growth performance, carcass characteristics, feed efficiency and cost of gain of lambs sired by rams excelling in growth and carcass characteristics (Suffolk) or maternal traits (Polypay). Thirty crossbred wether lambs sired by Suffolk (n=15) and Polypay (n=15) rams were weaned at 60 days of age, individually penned and fed a complete, pelleted diet. After a 7-day adjustment period, initial weights (35 ± 1.7 kg) were recorded. Throughout the feeding period, lambs had ad libitum access to the feed, daily feed intakes were determined and lambs remained on trial until a final weight of 56 kg was attained. One lamb was removed from the study during the growth phase. Following the growth period, lambs were processed in a commercial plant and carcass data (hot carcass weight, ribeye area, 12th rib fat thickness, yield grade and quality grade) collected. Suffolk-sired lambs attained the final weight sooner ($P=.008$), requiring 53 ± 2.2 days on feed (DOF) compared to 62 ± 2.2 DOF for the Polypay-sired lambs. ADG was greater ($P=.0001$) for Suffolk-sired lambs ($.39 \pm .01$ kg/d vs. $.33 \pm .01$ kg/d). Polypay-sired lambs required more ($P=.0002$) feed to attain the final weight (120.9 ± 4 kg vs. 108.1 ± 4 kg) resulting in lower gain:feed values (.17 vs. .19). No differences were found between sire groups in carcass yield grade or carcass quality grade, however, the ribeye area of the Suffolk-sired lambs was larger ($P=.0002$; $17.65 \pm .42$ cm²) than Polypay-sired lambs ($15.09 \pm .41$ cm²). Suffolk-sired lambs had less ($P=.09$) 12th rib fat ($.66 \pm .05$ vs. $.78 \pm .05$ cm). Based on a feed cost of \$150/ton, the cost of gain of Suffolk-sired lambs was \$.84/kg compared to \$.98/kg of the Polypay-sired lambs. From these results it is concluded that there is a cost of gain advantage for lambs sired by rams excelling in growth traits.

Key Words: Lamb, Growth, Cost of Gain

1109 Effects of the callipyge gene on birth weight and weaning weight of Rambouillet lambs. S. P. Jackson, A. D. Herring, and B. L. Barham*, *Texas Tech University, Lubbock.*

The objectives of this study were to determine the effects of the callipyge gene on birth weight and weaning weight of lambs. Data from 447 lambs was collected over 5 lambing seasons. Sixteen sires and 9 maternal grandsires are included in the analysis. Sources of variation were sex of lamb (SOL), age of lamb (AOL), lamb phenotype (LPH), sire phenotype (SPH), dam phenotype (DPH), age of dam (AOD), maternal grandsire (MGS), type of birth (TOB), and type of rearing (TOR). Birth weights were not significantly different between lambs of normal (4.5 kg) or callipyge (4.6 kg) phenotypes. Lamb birth weight was affected by SOL, TOB, AOD, MGS. Neither DPH or SPH had a significant effect on birth weight of lambs. Ram lambs (4.8 kg) were heavier ($P < .0001$) at birth than ewe lambs (4.4 kg). Single (5.3 kg) lambs were heavier ($P < .0001$) than twins (4.5 kg) and triplets (3.9 kg). Weaning weights were affected by MGS, LPH, sex, AOL, TOB, TOR, AOD and interactions between DPH and TOB, and between DPH and SOL. No significant differences in weaning weight were detected that were due to sire, SPH or DPH. Callipyge (21.4 kg) lambs were heavier ($P < .001$) at weaning than normal (19.7 kg) lambs. Male (21.0 kg) lambs weaned heavier ($P < .01$) than females (20.0 kg), and single (22.4 kg) lambs weaned heavier than both twins (19.6 kg) and triplets (20.0 kg). In this study, birth weight did not differ significantly between callipyge lambs and normal lambs, however, the callipyge gene in lambs had a positive effect on lamb weaning weights. There were no significant differences in birth or weaning weights of lambs produced by normal or callipyge ewes.

Key Words: Sheep, Callipyge, Weaning Weight

1110 Carcass traits of growing Spanish x Boer kids as influenced by gender and age. M. Cameron¹, T. Sahlul¹, C. Gilchrist¹, S. Hart^{*1}, A. Goetsch^{1,3}, and S. Coleman², ¹E (Kika) de la Garza Institute for Goat Research, Langston University, Langston, OK, ²USDA/ARS Grazinglands Research Lab, El Reno, OK, ³USDA/ARS Dale Bumpers Small Farms Research Center, Booneville, AR.

Sixty kids (20 intact males, castrates and females) were utilized (3 x 5 factorial) to investigate effects of gender and age on carcass characteristics. Kids consumed ad libitum a corn-based concentrate (80% TDN, 3.6 Mcal/kg DE, 18% CP, and 12% ADF). Twelve kids (four per gender; average age 93-d) were slaughtered initially and at 8-wk intervals for a total of five slaughters (13, 21, 29, 37, 45 wk of age). Live weight (16.4, 22.1, 27.7, 38.8, and 44.4 kg) and hot carcass weight (6.8, 10.8, 13.8, 19.9, and 22.6 kg, respectively) increased linearly ($P < 0.001$) with age. Dressing percentage, as a percentage of empty BW, increased ($P < 0.001$) linearly and quadratically with age (50.1, 53.9, 53.5, 55.4, and 54.4%) but was unaffected by sex. Loin eye area (LEA) increased linearly ($P < 0.05$) with age (7.29, 10.19, 11.10, 13.55, and 13.74 cm²). Digestive organ mass increased linearly ($P < 0.001$) with age (1.20, 1.39, 1.46, 2.07, and 2.10 kg) but the contribution to empty body mass (8.8, 6.9, 5.7, 5.7, and 5.1%) decreased quadratically ($P < 0.001$). Gut fill increased quadratically ($P < 0.02$) with age (2.76, 2.18, 1.89, 2.89, and 2.84 kg). Females had less ($P < 0.004$) digestive organ mass and fill (organ mass: 1.74, 1.45, and 1.74 kg; fill: 2.75, 2.06, and 2.91 kg for castrates, females and males, respectively). Internal fat increased quadratically with age (0.32, 1.08, 1.60, 2.77, and 4.08 kg). Internal fat comprised 6.9, 7.0, and 5.1% of empty BW for castrates, females and males, respectively. Internal fat deposition, as a percentage of empty BW, showed the greatest increases ($P < 0.001$) during the early and latter stages of growth (2.3, 5.4, 6.3, 7.7, and 9.9% at 13, 21, 29, 36 and 45-wk). In conclusion, changes in internal fat deposition with advancing age may impact increases in lean tissue accretion by Boer crossbreds.

Key Words: Goat, Carcass, Growth

1111 Influence of Zeranol implant on the growth, feed conversion and carcass traits in goat kids. S. Gebrelul¹, M. O. lheanacho^{1*}, O. Phelps¹, G. Simon¹, and J. M. Fernandez², ¹Southern Univ., Baton Rouge and ²Louisiana State Univ. Agricultural Center, Baton Rouge.

In a 2 x 2 factorial arrangement, twenty-four kids from the Southern University goat farm were randomly divided into two treatment groups. The first group (IMPL) was implanted with 12 mg Ralgro/hd. The second group served as control (CONT). Each group consisted of six Boer cross (BOERX) and six non-Boer (MIXED) purebred kids. Kids were placed in 35cm x 1m pens and individually fed daily from 9:00 to 11:00 a.m. Daily feed intakes were recorded. Weights were taken biweekly. The feeding study lasted for 42 days. Male kids (n=13) were slaughtered at the end of the feeding period for carcass evaluation. Data were analyzed using SAS's GLM procedure with treatment, genetic groups and interaction included in the model. Age in days and initial weights of kids were included as covariates. Except for higher ($P < 0.05$) feed intake by the IMPL group, no differences were observed in body weights, average daily gains or feed efficiency between the implanted and control groups. Summary results, by treatment-genetic combinations, for final weight WT, kg), feed intake (FI), average daily gains (ADG), feed efficiency (FE), chilled carcass weight (CCWT), and loin eye area (LEA) are tabulated below.

Implant	Genetic Group	WT, kg	FI, g/d	ADG, g/d	FE	CCWT, kg	LEA, cm ²
CONT	BOERX	17.1 ^a	274.1 ^a	114.2	7.9	5.5 ^a	5.2
	MIXED	13.0 ^b	236.4 ^b	87.8	8.5	3.0 ^b	4.2
IMPL	BOERX	18.0 ^a	308.0 ^a	131.7	8.3	7.4 ^a	5.5
	MIXED	16.8 ^a	297.5 ^a	116.1	8.2	5.9 ^a	4.3
Approx. S.E.		1.6	11.2	16.9	1.1	1.0	1.1

^{a,b} Means with different superscripts within the same column are different ($P < 0.05$)

Key Words: Goat, Implant, Growth

1112 Body weight gains of weaned 1/4 Mesopotamian Fallow, European Fallow and Axis bucks in drylot, on ryegrass pasture or on coastal bermudagrass pasture. D. A. Neuendorff^{*1}, S. M. Webb¹, G. W. Evers¹, R. K. Miller², and R. D. Randel¹, ¹*Texas Agricultural Experiment Station, Overton*, ²*Texas A&M University, College Station*.

Crossbred Mesopotamian Fallow, European Fallow and Axis deer are currently being used for venison production under various management systems. Twenty eight 1/4 Mesopotamian Fallow bucks, twelve European Fallow bucks and six Axis bucks weaned in October 1995 were evaluated for body weight gains in feedlot, winter pasture and summer pasture feeding management systems. From October 29, 1995 through January 12, 1996 (78 d), the bucks were kept in a drylot and fed 3% BW/hd/d of 2:1 alfalfa pellets:ground corn and free choice Coastal bermudagrass hay, salt, minerals and water (Feedlot). From January 24 through April 3, 1996 (70 d), the bucks grazed ryegrass pastures with free choice access to water, salt and minerals (Winter Pasture). From June 11 through August 6, 1996 (57 d), the bucks grazed Coastal bermudagrass pastures with free choice access to water, salt and minerals (Summer Pasture). BW and ADG were recorded for each animal type at 28 d intervals within the Feedlot, Winter Pasture and Summer Pasture systems. ADG's were greater ($P<.0001$) in the Feedlot for 1/4 Mesopotamian Fallow (.10kg) compared with European Fallow (.07kg) or Axis (.05kg) bucks which did not differ. Similar performance was noted in the Winter Pasture period with greater ($P<.004$) ADG's for 1/4 Mesopotamian Fallow (.11kg) compared with European Fallow (.09kg) or Axis (.07kg) bucks which did not differ ($P>.1$). During the Summer Pasture period greater ($P<.02$) ADG's were found in the Axis (.05kg) than in the 1/4 Mesopotamian Fallow (.01kg) with the European Fallow (.03kg) being intermediate and not different from any other type. The more temperate, larger 1/4 Mesopotamian Fallow crossbred bucks were superior in growth rate during the cooler seasons with higher nutrition while the more tropical, smaller axis bucks were superior during the warm season with lower quality forage.

Key Words: Exotic Deer, Growth, Nutrition

1113 Comparison of growth and carcass traits of yearling European Fallow with Axis and 1/4 Mesopotamian Fallow bucks. S. M. Webb^{*1}, D. A. Neuendorff¹, G. W. Evers¹, R. K. Miller², and R. D. Randel¹, ¹*Texas Agricultural Experiment Station, Overton*, ²*Texas A&M University, College Station*.

Two experiments were conducted to compare growth and carcass traits of European Fallow (EF), Axis (A) and 1/4 Mesopotamian Fallow (MF) yearling bucks. The first experiment consisted of 6 EF and 6 A bucks weaned in Oct. 1995. The bucks grazed ryegrass from Jan. through Apr. and Coastal bermudagrass from Apr. through Aug. The bucks were weighed at 28 d intervals throughout the 305 d period. Carcass data were evaluated for hot carcass weight, dressing percentage, carcass and leg conformation scores, leg weight (bone in), tenderloin weight and boneless sirloin weight. BW gains were similar but live weight at slaughter tended ($P<.08$) to be greater in A. Hot carcass and dressing percentage were greater ($P<.01$) for A when compared to EF bucks. Carcass and leg conformation scores were greater ($P<.02$) in A as well as weight of leg (bone in) and weight of boneless sirloin ($P<.01$), which both made up a greater portion of hot carcass weight. The second experiment consisted of 28 MF and 6 EF bucks weaned in Oct. 1995. The bucks grazed ryegrass from Jan. through Apr. and Coastal bermudagrass from Apr. through Aug. The bucks were weighed at 28 d intervals throughout the 291d period. Carcass data were evaluated as in the first experiment. The MF had greater ADG and live weight at slaughter and a greater hot carcass weight ($P<.01$) when compared to EF. Dressing percent and weight of leg (bone in) was similar with weight of leg (bone in) making up a greater percent of hot carcass weight ($P<.02$) in EF. Weights of the neck and shoulder, rib and boneless sirloin were greater ($P<.03$) in MF. The A showed superior carcass traits when compared to the EF while the larger MF carcass traits were superior to both A and EF.

Key Words: Exotic Deer, Growth, Carcass

1114 Thyroid picture and growth performance of Egyptian saidi rams fed some agriculture residues treated with urea and supplemented with live yeast. A. E. Zayed¹, H. A. Daghash², A. Abou-Elmagd¹, and G. A. Abd El-Hafiz¹, ¹*Department of Anatomy and Histology, Faculty of Vet.Med., Assiut University* ²*Department of Animal Production, Faculty of Agriculture, Assiut University, Assiut, Egypt*.

Twenty Egyptian Saidi rams aging 8 months with an average body weight of about 34 Kg were used in this study. They were randomly divided into 4 groups, each one consisted of 5 animals. All animals were fed a diet consisting of commercial concentrate mixture and roughages viz; wheat straw, corn cobs, sugar cane tops and bagasse for the first (control), second, third and fourth groups, respectively. The used roughages, except wheat straw, were treated with 1% urea. All animals, except the control, were fed 10 g live yeast per head per day. Feed intake, weight gain, thyroid morphology and levels of thyroid hormone (T_4), total cholesterol and glucose as well as T_4 uptake and free thyroxine index (FTI) were investigated. The feed intake and weight gain were significantly high in groups given sugar cane tops and corn cobs as compared with the control. A significantly high T_4 and glucose accompanied by low total cholesterol levels were recorded in all groups when compared to the group fed wheat straw. The present differences between the studied groups in the volume density and structure of the various components of the thyroid gland reflect the close relationship between the ration constituents and the thyroid morphology. A morphologically active thyroid gland in the groups given bagasse and sugar cane tops in comparison with the control group explains their high serum level of T_4 . A less morphologically active thyroid gland (compared with the control) in the group fed corn cobs, despite the relatively high T_4 in the blood, may be attributed to the low thyroid hormone consumption by tissues in this group. In conclusion, this study showed that feeding uncommonly used agricultural feed residues particularly sugar cane tops and corn cobs, treated with urea and supplemented by live yeast reflects good performance of sheep which may be attributed to the slightly low iodine intake in these groups that lead to an increase in the function of the thyroid gland in addition to the good palatability of these roughages.

Key Words: Agriculture Feed Residues, Thyroid, Growth